VOLUME 24 / NUMBER 11
JUNE 8, 1986
ACC. NOS. N86-20341 TO N86-21499

STAR

AN ABSTRACT JOURNAL

Scientific and Technical Aerospace Reports

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Scientific and Technical Aerospace Reports, Volume 24, is prepared by the NASA Scientific and Technical Information Facility operated for the National Aeronautics and Space Administration by RMS Associates.

The Administrator of the National Aeronautics and Space Administration has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Agency. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through March 22, 1988.

US ISSN 0036-8741

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For related information see also *Astronautics*.

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For related information see also *34 Fluid Mechanics and Heat Transfer*.

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For related information see also *07 Aircraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

CHEMISTRY AND MATERIALS

Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; and propellants and fuels.

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Includes engineering (general); communications; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.
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55 PLANETARY BIOLOGY **1842**
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84 LAW AND POLITICAL SCIENCE **1885**
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION **1886**
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) **1887**

89 ASTRONOMY **1887**
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS **1888**
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION **1890**
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS **1891**
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION **1892**
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL **1893**

Note: N.A. means that no abstracts were assigned to this category for this issue.

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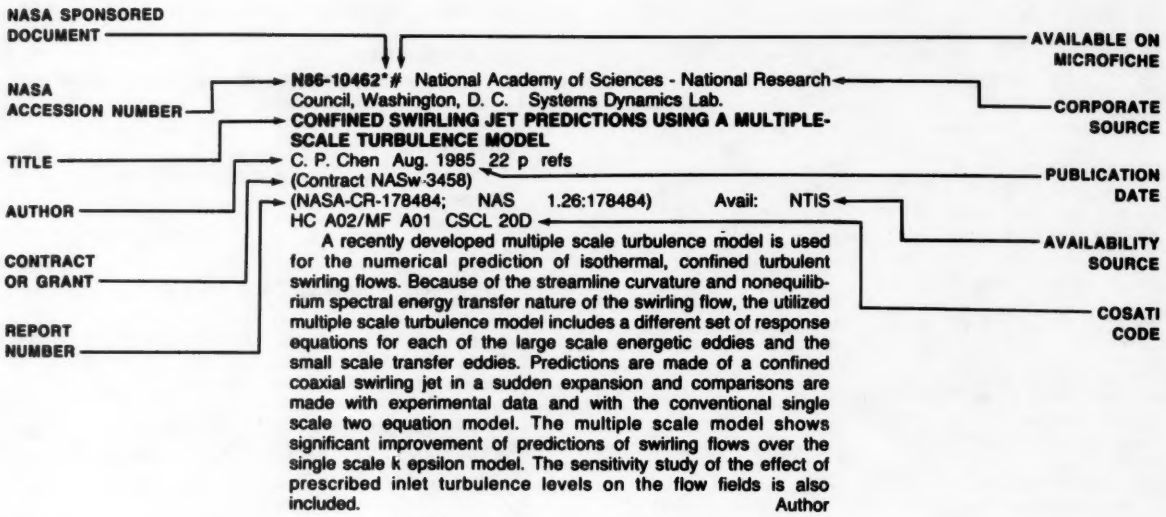
TYPICAL CITATION AND ABSTRACT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N86-10462*# National Academy of Sciences - National Research Council, Washington, D. C. Systems Dynamics Lab.
CONFINED SWIRLING JET PREDICTIONS USING A MULTIPLE-SCALE TURBULENCE MODEL
C. P. Chen Aug. 1985 22 p refs
(Contract NASw-3458)
(NASA-CR-178484; NAS 1.26:178484) Avail: NTIS
HC A02/MF A01 CSCL 20D
A recently developed multiple scale turbulence model is used for the numerical prediction of isothermal, confined turbulent swirling flows. Because of the streamline curvature and nonequilibrium spectral energy transfer nature of the swirling flow, the utilized multiple scale turbulence model includes a different set of response equations for each of the large scale energetic eddies and the small scale transfer eddies. Predictions are made of a confined coaxial swirling jet in a sudden expansion and comparisons are made with experimental data and with the conventional single scale two equation model. The multiple scale model shows significant improvement of predictions of swirling flows over the single scale k epsilon model. The sensitivity study of the effect of prescribed inlet turbulence levels on the flow fields is also included.
Author

VOLUME 24 NUMBER 11 / JUNE 8, 1986

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N86-20341* National Aeronautics and Space Administration, Washington, D.C.
AERONAUTICAL ENGINEERING, A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 197)
Feb. 1986 139 p
(NASA-SP-7037(197); NAS 1.21:7037(197)) Avail: NTIS HC A07 CSCL 01A

This bibliography lists 488 reports, articles and other documents introduced into the NASA scientific and technical information system in January 1986. Author

N86-20342*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AEROELASTICITY AT THE NASA LANGLEY RESEARCH CENTER RECENT PROGRESS, NEW CHALLENGES
Perry W. Hanson Dec. 1985 76 p refs
(NASA-TM-87660; NAS 1.15:87660) Avail: NTIS HC A05/MF A01 CSCL 01B

Recent progress in aeroelasticity, particularly at the NASA Langley Research Center is reviewed to look at the questions answered and questions raised, and to attempt to define appropriate research emphasis needed in the near future and beyond. The paper is focused primarily on the NASA Langley Research Center (LaRC) Program because Langley is the lead NASA center for aerospace structures research, and essentially is the only one working in depth in the area of aeroelasticity. Historical trends in aeroelasticity are reviewed broadly in terms of technology and staffing particularly at the LaRC. Then, selected studies of the Loads and Aeroelasticity Division at LaRC and others over the past three years are presented with attention paid to unresolved questions. Finally, based on the results of these studies and on perceptions of design trends and aircraft operational requirements, future research needs in aeroelasticity are discussed. Author

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N86-20343# Iowa State Univ. of Science and Technology, Ames. Coll. of Engineering.
MODULAR APPLICATION OF A SHOCK/BOUNDARY LAYER INTERACTION SOLUTION TO SUPERCRITICAL VISCOUS-INVISCID FLOW FIELD ANALYSIS
G. R. Inger and W. G. Habashi, ed. 1984 40 p refs Reprinted from Computational Methods in Viscous Flows. Volume 3: Recent Advances in Numerical Methods in Fluids (Swansea, England), 1984 p 1-38
Avail: NTIS HC A03/MF A01

Shock boundary layer interaction influence extends significantly downstream within the boundary layer and thereby alters the global aerodynamic properties of lift, drag and pitching moment. Shock boundary layer interactions and their Reynolds and Mach number scaling must be fundamentally understood and appropriate theoretical tools be developed for their prediction in engineering applications. Features of an approximate nonasymptotic triple deck theory of shock turbulent boundary layer interaction and its application as an element in the overall viscous flow analysis of the body are described. Two main aspects of the problem are examined: local interactive thickening and skin friction drop in the shock foot region, including the effects of the incoming boundary layer shape factor, wall curvature, an improved viscous ramp model of the interaction and an approximate prediction of incipient separation behavior; and influence of such interaction on the subsequent downstream turbulent boundary layer thickening, profile shape and skin friction behavior. Comparisons with experimental data are given and applications presented for both supercritical airfoils and transonic bodies of revolution. Author

N86-20344*# George Washington Univ., Washington, D.C.
EXPLORATORY LOW-SPEED WIND-TUNNEL STUDY OF CONCEPTS DESIGNED TO IMPROVE AIRCRAFT STABILITY AND CONTROL AT HIGH ANGLES OF ATTACK M.S. Thesis
David Edgar Hahne Dec. 1985 73 p refs Sponsored by NASA
(NASA-CR-176615; NAS 1.26:176615) Avail: NTIS HC A04/MF A01 CSCL 01A

A wind tunnel investigation of concepts to improve the high angle-of-attack stability and control characteristics of a high performance aircraft was conducted. The effect of vertical tail geometry on stability and the effectiveness of several conventional and unusual control concepts was determined. These results were obtained over a large angle-of-attack range. Vertical tail location, cant angle and leading edge sweep could influence both longitudinal and lateral-directional stability. The control concepts tested were found to be effective and to provide control into the post stall angle-of-attack region. Author

N86-20345*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECT OF UNDERWING AFT-MOUNTED NACELLES ON THE LONGITUDINAL AERODYNAMIC CHARACTERISTICS OF A HIGH-WING TRANSPORT AIRPLANE
William K. Abeyounis and James C. Patterson, Jr. Dec. 1985 139 p refs
(NASA-TP-2447; L-15664; NAS 1.60:2447) Avail: NTIS HC A07/MF A01 CSCL 01A

As part of a propulsion/airframe integration program, tests were conducted in the Langley 16-Foot Transonic Tunnel to determine the longitudinal aerodynamic effects of installing flow through engine nacelles in the aft underwing position of a high wing transonic transfer airplane. Mixed flow nacelles with circular and D-shaped inlets were tested at free stream Mach numbers from

0.70 to 0.85 and angles of attack from -2.5 deg to 4.0 deg. The aerodynamic effects of installing antishock bodies on the wing and nacelle upper surfaces as a means of attaching and supporting nacelles in an extreme aft position were investigated. Author

N86-20346*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

INSTALLATION EFFECTS OF LONG-DUCT PYLON-MOUNTED NACELLES ON A TWIN-JET TRANSPORT MODEL WITH SWEPT SUPERCRITICAL WING

Edwin E. Lee, Jr. and Otis C. Pendergraft, Jr. Dec. 1985 145 p refs

(NASA-TP-2457; L-15932; NAS 1.60:2457) Avail: NTIS HC A07/MF A01 CSCL 01A

The installation interference effects of an underwing-mounted, long duct, turbofan nacelle were evaluated in the Langley 16-Foot Transonic Tunnel with two different pylon shapes installed on a twin engine transport model having a supercritical wing swept 30 deg. Wing, pylon, and nacelle pressures and overall model force data were obtained at Mach numbers from 0.70 to 0.83 and nominal angles of attack from -2 deg to 4 deg at an average unit Reynolds number of 11.9 x 1,000,000 per meter. The results show that adding the long duct nacelles to the supercritical wing, in the near sonic flow field, changed the magnitude and direction of flow velocities over the entire span, significantly reduced cruise lift, and caused large interference drag on the nacelle afterbody. Author

N86-20347*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

ORIFICE-INDUCED PRESSURE ERROR STUDIES IN LANGLEY 7- BY 10-FOOT HIGH-SPEED TUNNEL

E. B. Plentovich and Blair B. Gloss Feb. 1986 24 p refs

(NASA-TP-2545; L-16001; NAS 1.60:2545) Avail: NTIS HC A02/MF A01 CSCL 01A

For some time it has been known that the presence of a static pressure measuring hole will disturb the local flow field in such a way that the sensed static pressure will be in error. The results of previous studies aimed at studying the error induced by the pressure orifice were for relatively low Reynolds number flows. Because of the advent of high Reynolds number transonic wind tunnels, a study was undertaken to assess the magnitude of this error at high Reynolds numbers than previously published and to study a possible method of eliminating this pressure error. This study was conducted in the Langley 7- by 10-Foot High-Speed Tunnel on a flat plate. The model was tested at Mach numbers from 0.40 to 0.72 and at Reynolds numbers from 7.7 x 1,000,000 to 11 x 1,000,000 per meter (2.3 x 1,000,000 to 3.4 x 1,000,000 per foot), respectively. The results indicated that as orifice size increased, the pressure error also increased but that a porous metal (sintered metal) plug inserted in an orifice could greatly reduce the pressure error induced by the orifice. Author

N86-20348*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

STATIC INTERNAL PERFORMANCE OF A SINGLE-ENGINE ONAXISYMMETRIC-NOZZLE VANED-THRUST-REVERSER DESIGN WITH THRUST MODULATION CAPABILITIES

Laurence D. Leavitt and James R. Burley, II Dec. 1985 109 p refs

(NASA-TP-2519; L-15991; NAS 1.60:2519) Avail: NTIS HC A06/MF A01 CSCL 01A

An investigation has been conducted at wind-off conditions in the stati-test facility of the Langley 16-Foot Transonic Tunnel. The tests were conducted on a single-engine reverser configuration with partial and full reverse-thrust modulation capabilities. The reverser design had four ports with equal areas. These ports were angled outboard 30 deg from the vertical impart of a splay angle to the reverse exhaust flow. This splaying of reverser flow was intended to prevent impingement of exhaust flow on empennage surfaces and to help avoid inlet reingestion of exhaust gas when the reverser is integrated into an actual airplane configuration. External vane boxes were located directly over each of the four ports to provide variation of reverser efflux angle from 140 deg to 26 deg (measured forward from the horizontal reference axis). The reverser model was tested with both a butterfly-type inner door and an internal slider door to provide area control for each individual port. In addition, main nozzle throat area and vector angle were varied to examine various methods of modulating thrust levels. Other model variables included vane box configuration (four or six vanes per box), orientation of external vane boxes with respect to internal port walls (splay angle shims), and vane box sideplates. Nozzle pressure ratio was varied from 2.0 approximately 7.0. Author

N86-20349*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

AERODYNAMIC CHARACTERISTICS OF SEVERAL CURRENT HELICOPTER TAIL BOOM CROSS SECTIONS INCLUDING THE EFFECT OF SPOILERS

John C. Wilson and Henry L. Kelley Jan. 1986 74 p refs

(DA Proj. 1L1-61102-AH-45)

(NASA-TP-2506; L-15978; NAS 1.60:2506; AVSCOM-TR-85-B-3) Avail: NTIS HC A04/MF A01 CSCL 01A

Aerodynamic characteristics were determined of three cylindrical shapes representative of tail boom cross sections of the U.S. Army AH-64, UH-60, and UH-1H helicopters. Forces and pressures were measured in a wind-tunnel investigation at the Langley Research Center. Data were obtained for a flow incidence range from -45 to 90 deg and a dynamic pressure range from 1.5 to 50 psf. These ranges provided data representative of full-scale Reynolds numbers and the full range of flow incidence to which these helicopter tail boom shapes would be subjected at low flight speeds. The effects of protuberances such as tail rotor drive-shaft covers and spoilers were evaluated. The data indicate that significant side loads on tail booms of helicopters can be generated and that the addition of spoilers can beneficially alter the side loads. Although an increase in vertical drag occurs, the net effect through reduction of tail rotor thrust required can be an improvement in helicopter performance. Author

N86-20350*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

FLIGHT MEASUREMENTS OF SURFACE PRESSURES ON A FLEXIBLE SUPERCRITICAL RESEARCH WING

Clinton V. Eckstrom Dec. 1985 120 p refs

(NASA-TP-2501; L-15877; NAS 1.60:2501) Avail: NTIS HC A06/MF A01 CSCL 01A

A flexible supercritical research wing, designated as ARW-1, was flight-tested as part of the NASA Drones for Aerodynamic and Structural Testing Program. Aerodynamic loads, in the form of wing surface pressure measurements, were obtained during flights at altitudes of 15,000, 20,000, and 25,000 feet at Mach numbers from 0.70 to 0.91. Surface pressure coefficients determined from pressure measurements at 80 orifice locations are presented individually as nearly continuous functions of angle of attack for constant values of Mach number. The surface pressure coefficients are also presented individually as a function of Mach number for an angle of attack of 2.0 deg. The nearly continuous values of the pressure coefficient clearly show details of the pressure gradient, which occurred in a rather narrow Mach number range. The effects of changes in angle of attack, Mach number, and dynamic pressure are also shown by chordwise pressure distributions for the range of test conditions experienced. Reynolds numbers for the tests ranged from 5.7 to 8.4 x 1,000,000. Author

N86-20351*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

THE APPLICATION TO AIRFOILS OF A TECHNIQUE FOR REDUCING ORIFICE-INDUCED PRESSURE ERROR AT HIGH REYNOLDS NUMBERS

E. B. Plentovich Jan. 1986 44 p refs

(NASA-TP-2537; L-16002; NAS 1.60:2537) Avail: NTIS HC A03/MF A01 CSCL 01A

A wind tunnel investigation was conducted in the Langley 0.3-Meter Transonic Cryogenic Tunnel to study the effects of

porous (sintered metal) plug orifices on orifice-induced static-pressure measurement error at high Reynolds numbers. A NACA airfoil was tested at Mach numbers from 0.60 to 0.80 and at Reynolds numbers from 6 x 1,000,000 to 40 x 1,000,000. Data are included which compare pressure measurements obtained from porous plug orifices and from conventional orifices with diameters of 0.025 cm (0.010 in.) and 0.102 cm (0.040 in.). The two dimensional airfoil code GRUMFOIL was used to calculate boundary layer displacement thickness. The response time and the downstream effect of the porous plug orifice were considered in this investigation. The results showed that the porous plug orifice could be a viable method of reducing pressure error. The data also showed that the pressure measurements obtained with a 0.102-cm-diameter orifice were very close to the measurements obtained with 0.025-cm-diameter orifice over such of the airfoil and that downstream of a shock the orifice size was not critical.
Author

N86-20352*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
BREAKDOWN OF THE CONSERVATIVE POTENTIAL EQUATION
M. D. Salas and Clyde R. Gumbert Feb. 1986 38 p refs Previously announced in IAA as A85-19700
(NASA-TP-2539; L-15769; NAS 1.60:2539) Avail: NTIS HC A03/MF A01

The conservative full-potential equation is used to study transonic flow over five airfoil sections. The results of the study indicate that once shock are present in the flow, the qualitative approximation is different from that observed with the Euler equations. The difference in behavior of the potential eventually leads to multiple solutions.
Author

N86-20353# National Aeronautical Lab., Tokyo (Japan).
RESEARCH ON THE AERODYNAMIC CHARACTERISTICS OF VEHICLES BY FREE FLIGHT TESTING AT SUPERSONIC SPEEDS
Iwao Kawamoto Sep. 1985 74 p refs In JAPANESE; ENGLISH summary
(NAL-TR-876; ISSN-0389-4010) Avail: NTIS HC A04/MF A01

A new free flight testing technique was developed in the 1mx1m blow-down supersonic wind tunnel. The following results were obtained: (1) a new launching method in which a model is installed inside the launcher was developed, and various models were successfully launched at various angles of attack; (2) a data processing program for moving models was developed by use of a parameter identification method under the assumption of three degrees of longitudinal freedom of motion; (3) cone models, Mercury capsule models, blunt cone capsule models, sounding rocket models and supersonic aircraft models were launched, results were obtained from the flight tests. There sometimes existed a short duration of the freedom motion, the data reduction to this partial duration of motion are in agreement with the conventional wind tunnel force test results in the aerodynamic coefficients, the divergence of the pitching motion of the Mercury Capsule model was shown in pictures; (4) the relations between the amount of data gathered during a run and the aerodynamic characteristics derived thererom are discussed; and (5) the excessive nonlinear terms of alpha for the aerodynamic expressions sometimes result in unacceptable aerodynamic characteristics.
E.A.K.

N86-20354# National Aeronautical Lab., Bangalore (India). Fluid Mechanics Div.
JET PLUME TEMPERATURE EFFECTS ON AFTERBODY PRESSURE DISTRIBUTION AND DRAG
N. B. Mathur and K. S. Yajnik Mar. 1985 10 p refs
(NAL-TM-FM-8502) Avail: NTIS HC A02/MF A01

A typical axisymmetric configuration with a circular arc boat-tailed afterbody was investigated to study the jet plume temperature effects on afterbody pressure distribution and drag. The experiments which were carred out at a free stream Mach number of 0.62 and jet pressure ratio of about 3.0 show that as the jet temperature ratio is increased the afterbody pressures tend to increase and the afterbody pressure drag tends to decrease. It is a reduction in afterbody pressure drag by about 30 to 40% is shown when the jet plume temperature is increased from 307 deg K (cold jet) to 945 deg K. Both jet plume temperature and the afterbody surface temperature effects generally contribute to the observed changes in the pressure distribution and drag. E.A.K.

N86-20355# National Aeronautical Lab., Bangalore (India). Aerodynamics Div.
INVESTIGATION OF PASSIVE DEVICES FOR AXISYMMETRIC BASE DRAG REDUCTION AT TRANSONIC SPEEDS
P. R. Viswanath Sep. 1985 20 p refs
(NAL-TM-AE-8506) Avail: NTIS HC A02/MF A01

The effectiveness of several base modifications for reducing base drag and total afterbody drag at transonic speeds was assessed. The modifications include base cavities, ventilated cavities and two vortex suppression devices. It is shown that while appreciable base drag reductions are possible with many of the devices examined, the net total drag reuctions are lower, presumably because of the additional losses associated with the devices.
E.A.K.

N86-20356# National Aeronautical Lab., Bangalore (India). Aerodynamics Div.
SIDE FORCE CHARACTERISTICS OF A 20 DEG CONE AT HIGH ANGLES OF ATTACK
P. R. Viswanath and K. Y. narayan May 1985 24 p refs
(NAL-TM-AE-8503) Avail: NTIS HC A02/MF A01

Force measurements were made on a 20 deg. cone to study the features of side force generation at high angles of attack. The experiments covered a Mach number range of 0.17 to 0.25 and a Reynolds number range of 0.5 to 2.8x1,000,000. The model incidence was varied up to 47 deg. The magnitude of side forces and the onset angle of attack for side force generation are in fairly good agreement with other published data on cones. E.A.K.

N86-20357*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYSIS OF FULLY STALLED COMPRESSOR
Wojciech Rostafinski 1986 14 p refs Proposed for presentation at the 4th Joint Fluid Mechanics, Plasma Dynamics and Laser Conference, Atlanta, Ga., 12-14 May 1986; sponsored by AIAA and the American Society of Mechanical Engineers
(NASA-TM-87254; E-2944; NAS 1.15:87254) Avail: NTIS HC A02/MF A01 CSCL 21E

An analysis yields a model for energy transfer in compressor stages operating in the closed-throttle condition. The derivation indicates that three geometry parameters (hub/tip ration, aspect ration, and rotor blade setting angle) influence the values of pressure coefficient when the compressor flow is close to zero.
Author

N86-20358*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECTS OF PLANFORM GEOMETRY ON HOVER PERFORMANCE OF A 2-METER-DIAMETER MODEL OF A FOUR-BLADED ROTOR
Arthur E. Phelps, III and Susan L. Althoff Mar. 1986 33 p refs (DA Proj. 1L1-61102-AH-45)
(NASA-TM-87607; L-16020; NAS 1.15:87607;
AVSCOM-TR-85-B-6) Avail: NTIS HC A03/MF A01 CSCL 01A

Hover tests were conducted on three small scale rotors to evaluate the effects of blade planform taper on rotor hover performance. Tests were conducted on a rectangular swept-tip configuration, on a configuration with a 3 to 1 taper over the outboard 20 percent of the span, and on a configuration with a 5 to 1 taper over the outboard 20 percent of the blade span. The investigation covered a range of thrust coefficients from 0 to 0.0075 and a range of tip speeds from 300 to 600 ft/sec. The tests showed that both tapered configurations had better hover performance than the swept-tip rectangular configuration and that the 3 to 1 taper configuration was better than the 5 to 1 taper configuration. The test results were compared with predictions

made with a prescribed wake analysis, a momentum analysis, and a simplified free wake analysis. Author

N86-20359# Cranfield Inst. of Tech., Bedford (England). Coll. of Aeronautics.
HYPERSONIC FLOW PROBLEMS ASSOCIATED WITH FUTURE SPACE SHUTTLE VEHICLES
J. L. Stollery Sep. 1985 39 p refs
(CAR-8512) Avail: NTIS HC A03/MF A01

There is growing interest in reusable or partly reusable systems for putting vehicles into a Low Earth Orbit. Such a vehicle can act as a launch pad for satellites to be placed in geosynchronous or other high orbits; a staging post for orbital transfer vehicles and an observation platform and scientific laboratory. Because of the market for communication satellites which is estimated at around $150 billion over the next 10 years and the military uses of space, the interest in hypersonics is increasing rapidly. Out knowledge of transition, separation, viscous interaction including shock interaction and base flows, and heat transfer needs to be enlarged. B.G.

N86-20360*# Vigyan Research Associates, Inc., Hampton, Va.
METHOD FOR THE PREDICTION OF THE INSTALLATION AERODYNAMICS OF A PROPFAN AT SUBSONIC SPEEDS: USER MANUAL
B. Chandrasekaran Jan. 1986 100 p refs
(Contract NAS1-17826)
(NASA-CR-178057; NAS 1.26:178057) Avail: NTIS HC A05/MF A01 CSCL 01A

This document is the user's guide for the method developed earlier for predicting the slipstream wing interaction at subsonic speeds. The analysis involves a subsonic panel code (HESS code) modified to handle the propeller onset flow. The propfan slipstream effects are superimposed on the normal flow boundary condition and are applied over the surface washed by the slipstream. The effects of the propeller slipstream are to increase the axial induced velocity, tangential velocity, and a total pressure rise in the wake of the propeller. Principles based on blade performance theory, momentum theory, and vortex theory were used to evaluate the slipstream effects. The code can be applied to any arbitrary three dimensional geometry, expressed in the form of HESS input format. The code can handle a propeller alone configuration or a propeller/nacelle/airframe configuration, operating up to high subcritical Mach numbers over a range of angles of attack. Inclusion of a viscous modelling is briefly outlined. Wind tunnel results/theory comparisons are included as examples for the application of the code to a generic supercritical wing/overwing Nacelle with a powered propfan. A sample input/output listing is provided. Author

N86-20361*# Vigyan Research Associates, Inc., Hampton, Va.
SUBSONIC FLOW INVESTIGATIONS ON A CRANKED WING DESIGNED FOR HIGH MANEUVERABILITY Final Report
Dhanvada M. Rao Feb. 1986 45 p refs
(Contract NAS1-17420)
(NASA-CR-178046; NAS 1.26:178046) Avail: NTIS HC A03/MF A01 CSCL 01A

The characteristic pitching moment nonlinearity of cranked wings limits their usable lift coefficient well below C sub L max. The potential of several aerodynamic devices, viz., fences, pylon vortex generators (PVG), mid-span strakes and cavity flaps, in delaying the pitch up onset on a 70/50 deg cranked wing was explored in low speed tunnel tests. Upper surface pressure measurements and low visualizations were conducted on a semi-span wing model to observe the vortex flow development with increasing angle of attack, and then to assess the effectiveness of the devices in controlling the collapse of vortex lift over the wing panel outboard of the crank. Force tests on a full span wing and body model were also conducted to assess the fence and PVG in improving the usable C sub L. Author

N86-20362# Aeronautical Research Labs., Melbourne (Australia).
A VISUALISATION STUDY OF THE VORTEX FLOW AROUND DOUBLE-DELTA WINGS
D. H. Thompson 1985 70 p refs
(ARL-Aero-R-165; AR-004-047) Avail: NTIS HC A04/MF A01

A family of double delta wings with leading edge sweep combinations of 80/80, 80/70, 80/60, 80/50, and 80/40 degrees was tested in a small towing tank. The hydrogen bubble technique was used to visualize the vortex patterns above the wings over a range of Reynolds numbers (based on centerline chord) from 7,000 to 100,000. The effects of variations in incidence and leading edge kink angle were examined. Reynolds number and leading edge cross section shape were found to have significant effects on the vortex structure. Attempts to visualize details of the upper surface secondary vortex flows met with only partial success. Author

N86-20363# Aeronautical Research Labs., Melbourne (Australia).
INTERNAL PERFORMANCE OF A VARIABLE RAMP MIXED COMPRESSION INTAKE AT MACH 3.05
S. A. Fisher 1985 59 p refs
(ARL-Aero-Prop-R-167; AR-004-041) Avail: NTIS HC A04/MF A01

Results of an experimental investigation into the performance of a two dimensional mixed compression intake are presented. The intake featured focused cowl compression matched to a discrete slot boundary layer bleed system. The tests were conducted at the intake design Mach number of 3.05. The design worked well in a two dimensional sense, but the losses were exacerbated by three dimensional viscous effects involving the sidewall boundary layers. Author

N86-20364# National Aerospace Lab., Tokyo (Japan).
NUMERICAL ANALYSIS OF INVISICID FLOWS ABOUT WING-FUSELAGE COMBINATIONS. 2: DEVELOPMENT OF FULL POTENTIAL FLOW CODE YOKUDO-P
Tomiko Ishiguro 1985 87 p refs In JAPANESE; ENGLISH summary
(NAL-TR-881; ISSN-0389-4010) Avail: NTIS HC A05/MF A01

The main purpose of this paper is to numerically analyze inviscid flows about wing-fuselage combinations. In the second series a numerical procedure is developed for calculating full potential flows about wing-fuselage combinations by the successive-line-over-relaxation method of the rotated finite difference scheme, using the grids which have already been generated by the code YOKUDO-G in the first series. A user's manual for the FORTRAN code of the procedure is also described. Furthermore, many numerical examples are presented in order to show the utility of this code for flows about several wing-fuselage combinations under several free stream boundary conditions. The numerical results obtained by this code are compared with the experimental results and with numerical results of other methods. Author

N86-20365# National Aerospace Lab., Tokyo (Japan).
RESEARCH ON THE AERODYNAMIC CHARACTERISTICS OF VEHICLES BY FREE FLIGHT TESTING AT SUPERSONIC SPEEDS
Iwao Kawamoto 1985 74 p refs In JAPANESE; ENGLISH summary
(NAL-TR-876; ISSN-0389-4010) Avail: NTIS HC A04/MF A01

Results from free flight testing, developed in the 1mx1m blow-down supersonic wind tunnel of the National Aerospace Laboratory are presented. Models installed inside the launcher were successfully launched at various angles of attack. Using a parameter identification method (3 degrees longitudinal freedom of motion), a data processing program for moving models was developed. Aerodynamic coefficients were successfully derived. Cone models, Mercury Capsule models, blunt cone capsule models, sounding rocket models, and supersonic aircraft models were successfully launched. Though hard for vehicles with lifting surfaces to achieve 3 degrees of longitudinal freedom, a short duration of this motion was accomplished. Data reduction showed good agreement with wind tunnel results. Divergence of pitching motion of the mercury Capsule was clearly demonstrated. Excessive

nonlinear terms of alpha for aerodynamic expressions sometimes resulted in unacceptable aerodynamic characteristics. B.G.

N86-20366# National Aerospace Lab., Tokyo (Japan).
AERODYNAMIC TRANSFER FUNCTIONS FOR A FINITE WING IN INCOMPRESSIBLE FLOW
Hiroshi Matsushita Jul. 1985 59 p refs In JAPANESE; ENGLISH summary
(NAL-TR-867) Avail: NTIS HC A04/MF A01

Aerodynamic transfer functions for a wing with a control surface in an incompressible flow are presented analytically using Laplace transform technique. The aerodynamic transfer function for an airfoil can be analytically represented with the generalized Theodorsen function as circulatory parts and the rational function as noncirculatory parts. The aerodynamic transfer function for a finite wing is obtained in a closed form which includes the nonrational function called a modified circulation. A modified circulation function shows a finite wing effect and is governed by an integrodifferential equation, which can be solved efficiently by numerical computation. These results extend the simple harmonic theory to a general transient motion. With the expression thus obtained, the characteristics of the aerodynamic transfer function for a finite wing clearly show that it should have a branch point at the origin and have no singularities along the negative real axis. Transient aerodynamic forces in time domain such as an indicial lifts are obtained by inverse Laplace transforming the present results. Comparison of these results with the other methods and the experimental values shows a good agreement. Author

N86-20367# National Aerospace Lab., Tokyo (Japan).
A WIND TUNNEL TEST OF 22% SCALE MODEL OF A WINDMILL WITH A TWO-BLADED ROTOR OF 14m DIAMETER FOR FIELD TEST
Yoji Ishida, Mayayoshi Noguchi, and Shoichi Murota 1985 21 p refs In JAPANESE; ENGLISH summary
(NAL-TR-887; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

Aerodynamic characteristics of a horizontal axis windmill, rated at 20 KW at 8 m/s, with a two bladed rotor of 14m diameter is described. The blade of the windmill was basically designed so as to vary its geometry in such a way that the aerodynamic efficiency becomes maximum and then was fabricated with minor modifications needed to satisfy structural requirements. To confirm the aerodynamic characteristics of the windmill rotor, a wind tunnel test of a 22% scale model was performed in the National Aerospace Laboratory (NAL) low speed wind tunnel. Measurements were made of the efficiency, torque, axial drag force and initial torque for various combinations of the pitch angle and the tip speed ratio for a zero yaw angle. The data were corrected for the wake blockage effect. The yaw characteristics of the windmill were also measured. Author

N86-20368# Naval Ship Research and Development Center, Bethesda, Md.
LIFT DISTRIBUTION ON A HIGH ASPECT RATIO CIRCULATION CONTROL WING WITH ROOT LIFT CUTOUT Final Report, 1 Oct. 1982 - 1 Oct. 1983
Roger Joseph Furey Jun. 1985 56 p refs
(AD-A157024; DTNSRDC-85/030; AR-1294) Avail: NTIS HC A04/MF A01 CSCL 20/4

A computational procedure is developed, based on lifting line theory, which successfully predicts the spanwise lift distribution at moderate blowing momentum coefficient on a high aspect ratio (AR - 18) circulation control wing-body model with several variations in the spanwise extent of blowing. Experimental data are presented on the spanwise lift distribution which validates this procedure. Author

N86-20369# Sandia National Labs., Albuquerque, N. Mex.
AEROELASTIC EFFECTS IN THE STRUCTURAL DYNAMIC ANALYSIS OF VERTICAL AXIS WIND TURBINES
D. W. Lobitz and T. D. Ashwill 1985 7 p Presented at WINDPOWER 85, San Francisco, Calif., 27 Aug. 1985
(Contract DE-AC04-76DP-00789)
(DE85-017317; SAND-85-0957C; CONF-850834-2) Avail: NTIS HC A02/MF A01

Aeroelastic effects impact the structural dynamic behavior of vertical axis wind turbines (VAWTs) in two major ways. First the stability phenomena of flutter and divergence are direct results of the aeroelasticity of the structure. Secondly, aerodynamic damping can be important for predicting response levels particularly near resonance but also for off resonance conditions. The inclusion of the aeroelasticity is carried out by modifying the damping and stiffness matrices in the NASTRAN finite element code. Through the use of a specially designed preprocessor which reads the usual NASTRAN input deck and adds appropriate cards to it the incorporation of the aeroelastic effects has been made relatively transparent to the user. NASTRAN flutter predictions are validated using field measurements and the effect of aerodynamic damping is demonstrated through an application to the Test Bed VAWT being designed at Sandia. DOE

N86-20370# Sandia National Labs., Albuquerque, N. Mex.
AIRFOIL TREATMENTS FOR VERTICAL AXIS WIND TURBINES
P. C. Klimas 1985 7 p Presented at WINDPOWER 85, San Francisco, Calif., 27 Aug. 1985
(Contract DE-AC04-76DP-00789)
(DE85-017369; SAND-85-1910C; CONF-850834-3) Avail: NTIS HC A02/MF A01

Sandia National Laboratories (SNL) has taken three airfoil related approaches to decreasing the cost of energy of vertical axis wind turbine (VAWT) systems; airfoil sections designed specifically for VAWTs, vortex generators (VGs), and pumped spoiling. SNL's blade element airfoil section design effort has led to three promising natural laminar flow (NLF) sections. One section is presently being run on the SNL 17-m turbine. Increases in peak efficiency and more desirable dynamic stall regulation characteristics have been observed. Vane-type VGs were fitted on one DOE/Alcoa 100 kW VAWT. With approximately 12% of span having VGs, annual energy production increased by 5%. Pumped spoiling utilizes the centrifugal pumping capabilities of hollow blades. With the addition of small perforations in the surface of the blades and valves controlled by windspeed at the ends of each blade, lift spoiling jets may be generated inducing premature stall and permitting lower capacity, lower cost drivetrain components. SNL has demonstrated this concept on its 5-m turbine and has wind tunnel tested perforation geometries on one NLF section. DOE

N86-20371# Sandia National Labs., Albuquerque, N. Mex.
DEVELOPMENT DROP TEST RESULTS OF THE 15-FT-DIA RIBBON PARACHUTE AND 73-FT-DIA CROSS PARACHUTE FOR THE US ARMY NATICK LABORATORY UHLCADS SYSTEM
W. B. Pepper Sep. 1985 27 p
(Contract DE-AC04-76DP-00789)
(DE85-017614; SAND-84-2183) Avail: NTIS HC A03/MF A01

During 1984 a series of 12 drop tests was conducted at the US Army Yuma Proving Ground near Yuma, Arizona to develop a new system to recover a 2200-lb resupply container from high altitude. The parachute system consists of a 15-ft-dia ribbon parachute reefed for 10 s and a 73-ft-dia cross parachute with no reefing. The system has been successfully demonstrated by flight tests. The impact velocity is 30 fps. DOE

N86-20372# British Aerospace Aircraft Group, Preston (England). Wind Tunnel Dept.
THE USE OF THE PANEL PROGRAM FOR INVESTIGATING WIND TUNNEL WALL CONSTRAINT
A. R. Whitaker Aug. 1984 49 p refs Presented at British Aerospace Wind Tunnel Sub Committee Specialists' Meeting, Preston, England, 21 Sep. 1983
(BAe-ARG-184) Copyright. Avail: Issuing Activity

The panel program was used to study the effects of lifting wake relocation and solid body blockage on a typical 2.7 x 2.1m low speed wind tunnel (LSWT) model at CL = 1.0. Wake

blockage effects (which are very significant at CL max) could not be studied using this method. Correction standards are validated by the panel program. However, lack of agreement of longitudinal stability between experimental results for 5.5m and 2.7 x 2.1m LSWTs is not fully explained. The panel program gives comprehensive views of interference over the model planform and reveals useful facts about the interference flowfield. The program was used for investigating nonlifting local flow problems, but the absence of a wake displacement model results in underestimates of the interferences. Author (ESA)

N86-20373# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
EDUCATION AND RESEARCH IN COMPRESSIBLE AERODYNAMICS. A SURVEY OF 15 YEARS ACTIVITIES AT THE LABORATORY FOR HIGH SPEED AERODYNAMICS
P. G. Bakker, W. J. Bannink, ed., J. Boeker, C. Nebbeling, ed., E. W. deKeizer, G. A. F. Beking, N. J. Lam, M. vanLent, J. A. G. vanGils, and J. A. Moeller Nov. 1983 63 p refs
(VTH-M-483) Avail: NTIS HC A04/MF A01

Educational and test facilities for high speed aerodynamics; sonic boom research; conical flow structures; and transonic flow and shock wave-boundary layer interaction are discussed. Author (ESA)

N86-20374# Technische Hogeschool, Eindhoven (Netherlands). Vakgroep Transportfysica.
A REVISION OF THE ACTUATOR DISK CONCEPT AND MOMENTUM THEORY
G. A. M. vanKuik Aug. 1985 62 p refs
(Rept-R-732-D) Avail: NTIS HC A04/MF A01

The analytical solution of the singularity problem in the limit case of edge flow on a disk with constant surface load is analyzed, leading to an extension of the actuator disk concept with edge forces. If these forces are taken into account in the momentum theory, the results are more convincing, and nuclear experimental phenomena can be explained. The shift of the momentum theory results is only indicated qualitatively. Author (ESA)

N86-20375# Technische Hogeschool, Delft (Netherlands). Inst. for Wind Energy.
PITCH-FLAP STABILITY OF A CENTRALLY HINGED RIGID ROTOR BLADE
W. P. Koppens Dec. 1984 31 p refs
(VTH-M-511) Avail: NTIS HC A03/MF A01

The pitch-flap stability of a centrally hinged rigid rotor blade rotating in still air is investigated. Quasi-steady strip theory is used to obtain the aerodynamic loads. The aerodynamic loads are compared with aerodynamic loads from the literature. The influence on the stability boundary of effective camber terms and angle of attack terms is investigated. It is concluded that the aerodynamic loads must be modeled carefully; it is inadequate to neglect terms of common chord-rotor radius ratio order. Author (ESA)

N86-20376# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
IMPROVEMENT OF AERODYNAMIC PERFORMANCE THROUGH BOUNDARY LAYER CONTROL AND HIGH LIFT SYSTEMS
B. Oskam (National Aerospace Lab., Amsterdam) and B. vanden-Berg (National Aerospace Lab., Amsterdam) May 1985 11 p
(AGARD-AR-210; ISBN-92-835-1498-X) Avail: NTIS HC A02/MF A01

This report presents an overall survey and evaluation of the AGARD Symposium on Improvement of Aerodynamic Performance through Boundary Layer Control and High Lift Systems held in Brussel. Belgium, 21 to 23 May 1984. Emphasis of the presentations and discussion on lift augmentation was on mechanical highlift systems, while laminar flow control and boundary layer manipulation shared the session on drag reduction. Significant interest was also shown in control of shock wave boundary layer interactions to mitigate their adverse effects. Author

N86-20422# Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France).
FUNDAMENTAL REFLECTIONS ON CRYOGENIC TESTING
Andre Mignosi *In* AGARD Special Course on Cryogenic Technology for Wind Tunnel Testing Jul. 1985 25 p refs (For primary document see N86-20415 11-09)
Avail: NTIS HC A18/MF A01

N86-20424# Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France). Dept. dAerothermodynamique.
THE T2 CRYOGENIC INDUCTION TUNNEL IN TOULOUSE
Jean-Bernard Dor *In* AGARD Special Course on Cryogenic Technology for Wind Tunnel Testing Jul. 1985 22 p refs (For primary document see N86-20415 11-09)
Avail: NTIS HC A18/MF A01

N86-20425# Aerodynamische Versuchsanstalt, Goettingen (West Germany). Inst. fuer Experimentelle Stroemungamechanik.
THE CRYOGENIC LUDWIEG TUBE TUNNEL AT GOETTINGER
G. Hefer *In* AGARD Special Course on Cryogenic Technology for Wind Tunnel Testing Jul. 1985 6 p refs (For primary document see N86-20415 11-09)
Avail: NTIS HC A18/MF A01

N86-20426# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).
THE KRYO-KANAL-KOELN (KKK) PROJECT: DESCRIPTION OF TUNNEL CONVERSION, INSULATION, CONTROLS, INSTRUMENTATION, OPERATIONAL EXPERIENCE AND FIRST PRELIMINARY TEST RESULTS
G. Viehweger *In* AGARD Special Course on Cryogenic Technology for Wind Tunnel Testing Jul. 1985 20 p refs Previously announced in IAA as A85-40314 (For primary document see N86-20415 11-09)
Avail: NTIS HC A18/MF A01

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N86-20377# National Transportation Safety Board, Washington, D. C.
SAFETY STUDY: ULTRAVIOLET VEHICLE ACCIDENTS Safety Study Report, Mar. 1983 - Sep. 1984
2 Jul. 1985 406 p refs
(PB85-917001; NTSB/SS-85/01) Avail: NTIS HC A18/MF A01

Since 1982, the Federal Aviation Administration (FAA) has regulated the operation of ultralight vehicles under 14 CFR Part 103. Increasing numbers of reports of ultralights being operated in regulated airspace and for nonrecreational purposes made it apparent to the Safety Board that an evaluation of the effectiveness of the FAA's regulatory approach to ultralights was needed. In the absence of a systematic accident data collection process on which to base the analysis, the Safety Board in March 1983 decided to investigate all fatal accidents involving a powered ultralight and other selected powered ultralight accidents involving obvious safety issues. Between March 1983 and September 1984, the Safety Board investigated 177 ultralight accidents, of which 88 involved a total of 93 fatalities. The Safety Board has prepared a report which describes the safety problems identified through analyses of these accidents, explores safety concerns raised by organizations and associations interested in ultralights, and recommends improvements in existing ultralight safety measures, where appropriate. Author

N86-20378# RMS Technologies, Inc., Trevose, Pa.
GALLEY AND OVERHEAD COMPARTMENT EXPERIMENT RESULTS: FULL-SCALE TRANSPORT CONTROLLED IMPACT DEMONSTRATION Final Report, Jun. 1981 - Dec. 1985
Roger M. Lloyd and Dick Johnson Dec. 1985 57 p refs

(Contract DTFA03-81-C-00040)
(DOT/FAA/CT-85/33) Avail: NTIS HC A04/MF A01

An air-to-ground impact test demonstration was conducted with a remotely piloted transport category airplane. The Full-Scale Transport Controlled Impact Demonstration Program (CID) is discussed. The program includes activities involved in the development and subsequent demonstration of an antimisting fuel experiment and experiments relating to improvements in cabin fire safety and structural impact protection. The results of structural experiments associated with two onboard galleys and overhead stowage compartments are reported. During the impact demonstration, both compartments remained in place without spillage of their internal contents, while the post crash fire resulted in minor galley damage and total destruction to the overhead compartments. E.A.K.

N86-20379*# Wichita State Univ., Kans.
PARTICLE TRAJECTORY COMPUTATION ON A 3-DIMENSIONAL ENGINE INLET Final Report Ph.D. Thesis
John J. Kim Jan. 1986 115 p refs
(Grant NAG3-566)
(NASA-CR-175023; NAS 1.26:175023; DOT-FAA-CT-86-1) Avail: NTIS HC A06/MF A01 CSCL 01C

A 3-dimensional particle trajectory computer code was developed to compute the distribution of water droplet impingement efficiency on a 3-dimensional engine inlet. The computed results provide the essential droplet impingement data required for the engine inlet anti-icing system design and analysis. The droplet trajectories are obtained by solving the trajectory equation using the fourth order Runge-Kutta and Adams predictor-corrector schemes. A compressible 3-D full potential flow code is employed to obtain a cylindrical grid definition of the flowfield on and about the engine inlet. The inlet surface is defined mathematically through a system of bi-cubic parametric patches in order to compute the droplet impingement points accurately. Analysis results of the 3-D trajectory code obtained for an axisymmetric droplet impingement problem are in good agreement with NACA experimental data. Experimental data are not yet available for the engine inlet impingement problem analyzed. Applicability of the method to solid particle impingement problems, such as engine sand ingestion, is also demonstrated. Author

N86-20380*# Toledo Univ., Ohio. Coll. of Engineering.
A NUMERICAL AND EXPERIMENTAL INVESTIGATION OF ELECTROCHEMICAL AIRCRAFT DEICING M.S. Thesis Final Report
Kevin L. Leffel Jan. 1986 268 p refs
(Grant NAG3-72)
(NASA-CR-175024; NAS 1.26:175024) Avail: NTIS HC A12/MF A01 CSCL 01C

This study was composed of three parts. The first part involved the extension of an existing transient two dimensional numerical code for an electrothermal deicer so that it would simulate the situation where a variable thickness ice layer existed at the outer surface. The Enthalpy Method was used to simulate the phase change, and Gauss-Seidel iteration was used to solve the resulting system of finite difference equations. A set of criteria were developed for determining when a variable thickness ice layer had an effect on deicer performance. The second part was the acquisition and analysis of experimental data. The test model was a section of a Bell UH-1H helicopter blade equipped with an electrothermal deicer. A total of fifty-two thermocouples were utilized to document the thermal response of the blade and decier assembly. In the deicing runs, the experimental temperature response data clearly showed when melting, shedding or refreezing occurred. The tests illustrated that the criterion for shedding in the three cases where it did occur was that the abrasion shield interface temperature was 32 to 34 F. The third part concerned the validation of a one dimensional transient thermal model of an electrothermal deicer by comparison of the predictions with the experimental data. The Enthalpy Method was found to effectively model the phase change which occurred, and the ice shedding algorithm employed in the simulation was also evaluated. Author

N86-20381# Boeing Commercial Airplane Co., Seattle, Wash. Flight Deck Research.
FLIGHT PHASE STATUS MONITOR STUDY. PHASE 2: OPERATIONAL SIMULATION Final Report, Jul. 1984 - Sep. 1985
G. P. Boucek, Jr., B. L. Berson (Lockheed Aircraft Co.), L. C. Summers (Douglas Aircraft Co.), and D. C. Hanson 1 Dec. 1985 170 p refs
(Contract DTFA01-83-20033)
(FAA-PM-85-34) Avail: NTIS HC A08/MF A01

Flight status monitor (FSM) concepts were studied for the Federal Aviation Association. Previous studies of crew alerting systems suggested the concept of a system which could monitor a flight, alert the crew to non-normal operation and system conditions, guide the crew through the appropriate response procedures and provide feedback to the crew concerning their actions. The major Phase 2 activities reported include: reviewing the results of Phase 1 and developing a test plan to evaluate the FSM system; using the results of Phase 1 to refine the FSM system specifications; finalizing the implementations of the FS simulator hardware and software; conducting evaluations of the system with experienced transport pilots; drawing conclusions and working recommendations concerning an FSM system by using the data developed in the evaluation; and identifying issues which used further investigation. Author

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N86-20382 British Aerospace Dynamics Group, Bristol (England). Guidance and Control Dept.
INTERPOLATION OF HEIGHTS AND SLOPES FROM A DIGITAL TERRAIN ELEVATION MODEL
R. F. Scott May 1982 12 p
(BAe-BT-13198) Copyright. Avail: Issuing Activity

An interpolation scheme for the TERPROM navigation system, that combines third order polynomials in the x and y directions to obtain a continuous surface which fits the terrain model exactly, conforming to whatever degree of intricacy the model can provide, is outlined. It is recommended that flights where deterioration occurred over rugged country are re-run with this interpolation to determine improvements in accuracy. Author (ESA)

N86-20383# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Geotechnical Lab.
EVALUATION OF THE FAA DESIGN PROCEDURES FOR HIGH TRAFFIC VOLUME PAVEMENTS Report, Jan. 1983 - May 1984
Starr D. Kohn Oct. 1985 144 p refs
(Contract DTFA01-81-Y-10555)
(DOT/FAA/PM-84/14) Avail: NTIS HC A07/MF A01

The results of a field study of the performance of high traffic volume airfield pavements is presented. Both rigid (portland cement concrete) and flexible (asphalt concrete) pavements were included in the study. Condition surveys and nondestructive testing were performed on the pavement sections in order to measure present performance and estimate load-carrying capacity. Traffic and material properties data were also collected for each pavement section. These parameters were used to compared thicknesses obtained using the current FAA design procedure and the thicknesses of the existing sections in order to evaluate the adequacy of the current design procedures. In general it was found that the design procedures are adequate; however, further field study has been recommended in order to verify collected data. Author

N86-20384*# Boeing Commercial Airplane Co., Seattle, Wash.
PERFORMANCE OF A COMMERCIAL TRANSPORT UNDER TYPICAL MLS NOISE ENVIRONMENT Final Report
John K. Ho Feb. 1986 55 p refs
(Contract NAS1-17635)
(NASA-CR-178032; NAS 1.26:178032; D6-57212) Avail: NTIS HC A04/MF A01 CSCL 17G

The performance of a 747-200 automatic flight control system (AFCS) subjected to typical Microwave Landing System (MLS) noise is discussed. The performance is then compared with the results from a previous study which had a B747 AFCS subjected to the MLS standards and recommended practices (SARPS) maximum allowable noise. A glide slope control run with Instrument Landing System (ILS) noise is also conducted. Finally, a linear covariance analysis is presented. Author

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N86-20385# National Aeronautical Lab., Bangalore (India). Structural Sciences Div.
MODAL ANALYSIS OF A TYPICAL FIGHTER AIRCRAFT USING TRANSIENT TESTING TECHNIQUE
R. Balasubramaniam, D. S. Ramakrishna, and P. S. VijayaKumar Dec. 1985 30 p refs
(NAL-TM-ST-8517) Avail: NTIS HC A03/MF A01

The dynamic performance of individual structural components and the whole aircraft was evaluated. The dynamic properties of the aircraft and its components were analyzed. One hundred and thirty-nine locations for transient imputs are chosen using an instrumented hammar and on-line data reduction for modal properties. Results from up to six modes of the natural frequency modal mass ans stiffness and damping tests are presented. The test set-up, choice of locations for excitations, and actual test procedures are outlined. The advantages of sweep-sine, step relation random and transient test methods on aircraft structures are discussed. E.A.K.

N86-20386*# Florida Univ., Gainesville. Dept. of Engineering Sciences.
OPTIMAL AIRFRAME SYNTHESIS FOR GUST LOADS Final Report
Prabhat Hajela Feb. 1986 45 p refs
(Grant NAG1-579)
(NASA-CR-178047; NAS 1.26:178047) Avail: NTIS HC A03/MF A01 CSCL 01C

An optimization capability for sizing airframe structures that are subjected to a combination of deterministic and random flight loads was established. The random vibration environment introduces the need for selecting a statistical process that best describes the random loads and permits computation of the dynamic response parameters of interest. Furthermore, it requires a formulation of design constraints that would minimize the conservativeness in the design and retain computational viability. The random loads are treated as a stationary, homogeneous process with a Gaussian probability distribution. The formulation of the analysis problem, the structure of the optimization programming system and a representative numerical example are discussed. Author

N86-20420*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DESIGN AND CONSTRUCTION OF MODELS FOR THE NATIONAL TRANSONIC FACILITY, PART 2
Clarence P. Young, Jr. *In* AGARD Special Course on Cryogenic Technology for Wind Tunnel Testing Jul. 1985 16 p refs Sponsored in part by NASA (For primary document see N86-20415 11-09)
Avail: NTIS HC A18/MF A01 CSCL 17G

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N86-20387 Department of the Air Force, Washington, D.C.
ASYMMETRIC THRUST WARNING SYSTEM FOR DUAL ENGINE AIRCRAFT Patent
William W. Stockton, inventor (to Air Force) Issued 8 Oct. 1985 4 p Supersedes AD-D010978
(AD-D011960; US-Patent-4,546,353; US-Patent-Appl-SN-577412; US-Patent-Class-340-966) Avail: US Patent and Trademark Office CSCL 01/4

An asymmetric thrust warning system for an aircraft having two gas turbine engines. The compressor discharge pressures of the two engines are compared to determine the engine providing the lower thrust and to provide a signal indicative of the actual difference in thrust. If the difference in thrust exceeds a prescribed value related to aircraft altitude, a low thrust warning lamp is illuminated. In addition, the positions of the two augmenter metering valves are compared. If their positions significantly differ, the warning light associated with the valve having the minimum opening will be illuminated. A stall warning circuit may also be included as a part of the system. GRA

N86-20388# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
AVIONICS STANDARDIZATION: PERCEPTIONS AND RECOMMENDATIONS M.S. Thesis
Jennifer A. Furru Sep. 1985 139 p
(AD-A161709; AFIT/GSM/LSY/85S-11) Avail: NTIS HC A07/MF A01 CSCL 15/5

This research effort reflects the perceptions and attitudes about avionics standardization by some members of the acquisition community. All of the interviewees were knowledgeable on the subject of and many had extensive experience with, avionics standardization. They either were currently working or had previously worked with avionics standardization. The analysis reflects some of the attitudes about the policies and procedures of avionics standardization and the role of the Deputy for Avionics Control in the process of standardization. The analysis also includes recommended changes to the current process of standardizing avionics equipment. The result of the research effort shows that the acquisition community has not accepted avionics standardization for a number of reasons. GRA

N86-20401# Marconi Avionics Ltd., Rochester (England). Flight Controls Div.
DIGITAL FLY-BY-WIRE EXPERIENCE
A. D. Hills *In* AGARD Fault Tolerant Hardware/Software Architecture Sep. 1985 8 p refs (For primary document see N86-20399 11-08)
Avail: NTIS HC A07/MF A01

N86-20402# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
REDUNDANCY MANAGEMENT OF SYCHRONOUS AND ASYNCHRONOUS SYSTEMS
Gregory M. Papadopoulos *In* AGARD Fault Tolerant Hardware/Software Architecture Sep. 1985 15 p refs (For primary document see N86-20399 11-08)
Avail: NTIS HC A07/MF A01

N86-20405# Laboratoire d'Automatique et d'Analyse des Systemes, Toulouse (France).
DEPENDABLE AVIONIC DATA TRANSMISSION
D. R. Powell and J. C. Valadier *In* AGARD Fault Tolerant

Hardware/Software Architecture Sep. 1985 19 p refs Sponsored in part by Direction des Recherches, Etudes et Techniques. Prepared in cooperation with Crouzet Aerospace and Systems, Valence, France, and Electronique Serge Dassault, St. Cloud, France (For primary document see N86-20399 11-08)
Avail: NTIS HC A07/MF A01

N86-20407# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
DESIGN ISSUES IN DATA SYNCHRONOUS SYSTEMS
Gregory M. Papadopoulos *In* AGARD Fault Tolerant Hardware/Software Architecture Sep. 1985 12 p refs (For primary document see N86-20399 11-08)
Avail: NTIS HC A07/MF A01

N86-20408# Northrop Corp., Hawthorne, Calif. Aircraft Div.
DIGITAL FAULT-TOLERANT FLIGHT ACTUATION SYSTEMS
Howard H. Belmont *In* AGARD Fault Tolerant Hardware/Software Architecture Sep. 1985 19 p (For primary document see N86-20399 11-08)
(Contract F33615-80-C-3623)
(AFWAL-83-3041) Avail: NTIS HC A07/MF A01

N86-20409# Honeywell Systems and Research Center, Minneapolis, Minn.
DESIGN VALIDATION OF FLY-BY-WIRE FLIGHT CONTROL SYSTEMS
Gary L. Hartmann, Joseph E. Wall, Jr., and Edward R. Rang *In* AGARD Fault Tolerant Hardware/Software Architecture Sep. 1985 17 p refs (For primary document see N86-20399 11-08)
Avail: NTIS HC A07/MF A01

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N86-20389* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
METHOD FOR IMPROVING THE FUEL EFFICIENCY OF A GAS TURBINE ENGINE Patent
George A. Coffinberry, inventor (to NASA) (General Electric Co., Cincinnati, Ohio) Issued 5 Nov. 1985 8 p 30 Aug. 1982
(NASA-Case-LEW-13142-2; US-Patent-4,550,561;
US-Patent-Appl-SN-413101; US-Patent-Class-60-39.02;
US-Class-60-39.07; US-Patent-Class-60-736) Avail: US Patent and Trademark Office CSCL 21E

An energy recovery system is provided for an aircraft gas turbine engine of the type in which some of the pneumatic energy developed by the engine is made available to support systems such as an environmental control system. In one such energy recovery system, some of the pneumatic energy made available to but not utilized by the support system is utilized to heat the engine fuel immediately prior to the consumption of the fuel by the engine. Some of the recovered energy may also be utilized to heat the fuel in the fuel tanks. Provision is made for multiengine applications wherein energy recovered from one engine may be utilized by another one of the engines or systems associated therewith.

Official Gazette of the U.S. Patent and Trademark Office

N86-20390*# Scientific Research Associates, Inc., Glastonbury, Conn.
INFLUENCE OF LARGE-SCALE MOTION ON TURBULENT TRANSPORT FOR CONFINED COAXIAL JETS. VOLUME 2: NAVIER-STOKES CALCULATIONS OF SWIRLING AND NON-SWIRLING CONFINED COAXIAL JETS Final Report
Bernard C. Weinberg and Henry McDonald Jan. 1986 57 p refs (Grant NAG3-350)
(NASA-CR-175036; NAS 1.26:175036) Avail: NTIS HC A04/MF A01 CSCL 21E

The existence of large scale coherent structures in turbulent shear flows has been well documented. Discrepancies between experimental and computational data suggest a necessity to understand the roles they play in mass and momentum transport. Using conditional sampling and averaging on coincident two-component velocity and concentration velocity experimental data for swirling and nonswirling coaxial jets, triggers for identifying the structures were examined. Concentration fluctuation was found to be an adequate trigger or indicator for the concentration-velocity data, but no suitable detector was located for the two-component velocity data. The large scale structures are found in the region where the largest discrepancies exist between model and experiment. The traditional gradient transport model does not fit in this region as a result of these structures. The large scale motion was found to be responsible for a large percentage of the axial mass transport. The large scale structures were found to convect downstream at approximately the mean velocity of the overall flow in the axial direction. The radial mean velocity of the structures was found to be substantially greater than that of the overall flow.

Author

N86-20391*# Clemson Univ., S.C. Dept. of Mechanical Engineering.
VISCOUS COMPRESSIBLE FLOW DIRECT AND INVERSE COMPUTATION AND ILLUSTRATIONS Final Report
Tah-Teh Yang and Francois Ntone Jan. 1986 102 p refs
(Grant NAG3-538)
(NASA-CR-175037; NAS 1.26:175037) Avail: NTIS HC A06/MF A01 CSCL 21E

An algorithm for laminar and turbulent viscous compressible two dimensional flows is presented. For the application of precise boundary conditions over an arbitrary body surface, a body-fitted coordinate system is used in the physical plane. A thin-layer approximation of tne Navier-Stokes equations is introduced to keep the viscous terms relatively simple. The flow field computation is performed in the transformed plane. A factorized, implicit scheme is used to facilitate the computation. Sample calculations, for Couette flow, developing pipe flow, an isolated airflow, two dimensional compressor cascade flow, and segmental compressor blade design are presented. To a certain extent, the effective use of the direct solver depends on the user's skill in setting up the gridwork, the time step size and the choice of the artificial viscosity. The design feature of the algorithm, an iterative scheme to correct geometry for a specified surface pressure distribution, works well for subsonic flows. A more elaborate correction scheme is required in treating transonic flows where local shock waves may be involved.

Author

N86-20392*# Oklahoma State Univ., Stillwater.
MEASUREMENTS OF A SINGLE LATERAL JET INJECTED INTO SWIRLING CROSSFLOW M.S. Thesis Final Report
L. H. Ong and D. G. Lilley Jan. 1986 92 p refs
(Grant NAG3-549)
(NASA-CR-175040; NAS 1.26:175040) Avail: NTIS HC A05/MF A01 CSCL 21E

Experiments have been conducted to document the time-mean and turbulent flowfield of a deflected turbulent jet in a confined swirling crossflow. The jet-to-crossflow velocity ratio of 4 was investigated with swirler vane angles of 45 and 70 degrees. A six-orientation single hot-wire technique was used to measure the velocities and turbulence properties of the flow. In addition, a five-hole pitot probe technique was used to measure the time-mean velocities or verification purposes. The results are presented in the form of r-x plots to aid visualization of the fully three-dimensional flowfield. The swirl in the crossflow intensified the local velocity at the location of the injected jet, which effectively reduced the jet-to-crossflow velocity ratio. This caused the trajectory of the injected jet to follow the path of the local flow direction of the

crossflow, and reduce its penetration into the crossflow. The time-mean velocity measurements using the hot-wire corresponded to pitot-probe data obtained in identical flow conditions. Turbulence stress data show the same trends as previous swirl flow data without lateral injection. The lateral jet was found to deflect the axis of the precessing vortex core. Author

N86-20393*# California Univ., Berkeley.
AERODYNAMIC PROPERTIES OF TURBULENT COMBUSTION FIELDS Final Report
Chia-Chun Hsiao and A. K. Oppenheim Nov. 1985 136 p
(Grant NAG3-131)
(NASA-CR-175005; NAS 1.26:175005) Avail: NTIS HC A07/MF A01 CSCL 21E

Flow fields involving turbulent flames in premixed gases under a variety of conditions are modeled by the use of a numerical technique based on the random vortex method to solve the Navier-Stokes equations and a flame propagation algorithm to trace the motion of the front and implement the Huygens principle, both due to Chorin. A successive over-relaxation hybrid method is applied to solve the Euler equation for flows in an arbitrarily shaped domain. The method of images, conformal transformation, and the integral-equation technique are also used to treat flows in special cases, according to their particular requirements. Salient features of turbulent flame propagation in premixed gases are interpreted by relating them to the aerodynamic properties of the flow field. Included among them is the well-known cellular structure of flames stabilized by bluff bodies, as well as the formation of the characteristic tulip shape of flames propagating in ducts. In its rudimentary form, the mechanism of propagation of a turbulent flame is shown to consist of: (1) rotary motion of eddies at the flame front, (2) self-advancement of the front at an appropriate normal burning speed, and (3) dynamic effects of expansion due to exothermicity of the combustion reaction. An idealized model is used to illustrate these fundamental mechanisms and to investigate basic aerodynamic features of flames in premixed gases. The case of a confined flame stabilized behind a rearward-facing step is given particular care and attention. Solutions are shown to be in satisfactory agreement with experimental results, especially with respect to global properties such as the average velocity profiles and reattachment length. Author

N86-20394*# Oklahoma Univ., Norman. School of Mechanical and Aerospace Engineering.
EXPERIMENTS ON OPPOSED LATERAL JETS INJECTED INTO SWIRLING CROSSFLOW M.S. Thesis Final Report
C. B. McMurry and D. G. Lilley Jan. 1986 116 p refs
(Grant NAG3-549)
(NASA-CR-175041; NAS 1.26:175041) Avail: NTIS HC A06/MF A01 CSCL 21E

Experiments have been conducted to obtain the time-mean and turbulent quantities of opposed lateral jets in a low speed, nonreacting flowfield. A jet-to-crossflow velocity ratio of R = v sub J/u sub 0 = 4 was used throughout the experiments, with swirl vane angles of d = 0 (swirler removed), 45 and 70 deg used with the crossflow. Flow visualization techniques used were neutrally-buoyant helium-filled soap bubbles and multispark photography in order to obtain the gross flowfield characteristics. Measurements of time-mean and turbulent quantities were obtained utilizing a six-orientation single hot-wire technique. For the nonswirling case, the jets were found not to penetrate past the test-section centerline, in contrast to the single lateral jet with the same jet-to-crossflow velocity ratio. In the swirling cases, the crossflow remains in a narrow region near the wall of the test section. The opposed jets are swept from their vertical courses into spiral trajectories close to the confining walls. Extensive results are presented in r-x plane plots. Author

N86-20395*# Connecticut Univ., Storrs.
INFLUENCE OF LARGE-SCALE MOTION ON TURBULENT TRANSPORT FOR CONFINED COAXIAL JETS. VOLUME 1: ANALYTICAL ANALYSIS OF THE EXPERIMENTAL DATA USING CONDITIONAL SAMPLING Final Report
David C. Brondum and John C. Bennett Jan. 1986 136 p refs (Grant NAG3-350)
(NASA-CR-175035; NAS 1.26:175035) Avail: NTIS CSCL 21E

The existence of large scale coherent structures in turbulent shear flows has been well documented. Discrepancies between experimental and computational data suggest a necessity to understand the roles they play in mass and momentum transport. Using conditional sampling and averaging on coincident two component velocity and concentration velocity experimental data for swirling and nonswirling coaxial jets, triggers for identifying the structures were examined. Concentration fluctuation was found to be an adequate trigger or indicator for the concentration-velocity data, but no suitable detector was located for the two component velocity data. The large scale structures are found in the region where the largest discrepancies exist between model and experiment. The traditional gradient transport model does not fit in this region as a result of these structures. The large scale motion was found to be responsible for a large percentage downstream at approximately the mean velocity of the overall flow in the axial direction. The radial mean velocity of the structures was found to be substantially greater than that of the overall flow. Author

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N86-20396*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THREE AXIS ATTITUDE CONTROL SYSTEM Patent Application
Philip A. Studer, inventor (to NASA) Filed 7 Nov. 1985 22 p
(NASA-Case-GSC-12970-1; NAS 1.71:GSC-12970-1;
US-Patent-Appl-SN-795805) Avail: NTIS HC A02/MF A01 CSCL 01C

A three axis attitude control system for an orbiting body comprised of a motor driven flywheel supported by a torque producing active magnetic bearing is described. Free rotation of the flywheel is provided about its central axis and together with limited angular torsional deflections of the flywheel about two orthogonal axes which are perpendicular to the central axis. The motor comprises an electronically commutated dc motor, while the magnetic bearing comprises a radially servoed permanent magnet biases magnetic bearing capable of producing cross-axis torques on the flywheel. Three body attitude sensors for pitch, yaw and roll generate respective command signals along three mutually orthogonal axes (x, y, z) which are coupled to circuit means for energizing a set of control coils for producing torques about two of the axes (x and y) and speed control of the flywheel about the third (z) axis. An energy recovery system, which is operative during motor deceleration, is also included which permits the use of a high speed motor to perform effectively as a reaction wheel suspended in the magnetic bearing. NASA

N86-20397*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AIRPLANE AUTOMATIC CONTROL FORCE TRIMMING DEVICE FOR ASYMMETRIC ENGINE FAILURES Patent application
Eric C. Stewart, inventor (to NASA) 23 Oct. 1985 14 p
(NASA-Case-LAR-13280-1; NAS 1.71:LAR-13280-1;
US-Patent-Appl-SN-790556) Avail: NTIS HC A02/MF A01 CSCL 01C

The difference in dynamic pressure in the propeller slipstreams as measured by sensors is divided by the freestream dynamic pressure generating a quantity proportional to the differential thrust coefficient. This quantity is used to command an electric trim motor to change the position of trim tab thereby retrimming the airplane to the new asymmetric power condition. The change in position of the trim tab produced by the electric trim motor is summed with the pilot's input to produce the actual trim tab position. NASA

N86-20398# Aeronautical Research Labs., Melbourne (Australia).
INTERACTIVE FLUTTER SOLVER AT ARL
S. Galea Jun. 1985 34 p
(AD-A161541; ARL/STRUC-TM-414) Avail: NTIS HC A03/MF A01 CSCL 20/4

An interactive direct flutter solving routine has been installed on ARL's ELXSI computer. Interactive graphics routines, using DI-3000 graphics, software, have been incorporated to give the user a progressive picture of the solution. Estimates of subcritical response data may also be determined using this method. A description of the method and the associated software is presented here. Also included is a two-dimensional flutter problem, using quasi-steady aerodynamics, which is solved by this direct flutter solver. GRA

N86-20399# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Guidance and Control Panel.
FAULT TOLERANT HARDWARE/SOFTWARE ARCHITECTURE FOR FLIGHT CRITICAL FUNCTION
Loughton, England Sep. 1985 146 p refs Lecture series held at Edwards AFB, Calif., 1-2 Oct. 1985, in Copenhagen, Denmark, 17-18 Oct. 1985, and in Athens, Greece, 21-22 Oct. 1985
(AGARD-LS-143; ISBN-92-835-1510-2) Copyright. Avail: NTIS HC A07/MF A01

This Lecture Series is intended to provide basic concepts and theories in the design of fault-tolerant architectures for flight critical systems. It is intended to cover experience with flight tested fly-by-wire systems as well as issues in redundancy management of synchronous and asynchronous approaches. It will specifically address the individual aspects of software fault tolerance, actuation fault tolerance, reliable data communication, and multi-computer operation using the Ada language. For individual titles, see N86-20400 through N86-20409.

N86-20400# Honeywell Systems and Research Center, Minneapolis, Minn.
INTRODUCTION TO LECTURE SERIES NO. 143: FAULT TOLERANT HARDWARE/SOFTWARE ARCHITECTURES FOR FLIGHT CRITICAL FUNCTIONS
Gary L. Hartmann *In* AGARD Fault Tolerant Hardware/Software Architecture Sep. 1985 3 p refs (For primary document see N86-20399 11-08)
Avail: NTIS HC A07/MF A01

Modern weapon systems, driven by escalating performance demands, are becoming complex and sophisticated. Demands for higher accuracy, improved reliability/survivability, all-weather operation, and more automation are placing increased emphasis on the control function. Nowhere is this increased emphasis more evident than in the control functions required in advanced aircraft systems. Due to the expanded role of automation many functions are becoming flight-critical (i.e., loss of this function is catastrophic). Flight critical architectures are more complex than fault-tolerant computers. In addition to airborne computers, overall reliability depends on proper design and management of: (1) Sensors and their interfaces; (2) Actuation elements; and (3) Data communication along the distributed elements. Previous NATO-AGARD publications have dealt with related aspects of this subject. This lecture series covers experience with flight tested fly-by-wire systems as well as issues in redundancy management of synchronous and asynchronous systems. It specifically addresses software fault tolerance, actuation fault tolerance, reliable data communications, and multi-computer operation using the Ada language.
Author

N86-20401# Marconi Avionics Ltd., Rochester (England). Flight Controls Div.
DIGITAL FLY-BY-WIRE EXPERIENCE c06
A. D. Hills *In* AGARD Fault Tolerant Hardware/Software Architecture Sep. 1985 8 p refs (For primary document see N86-20399 11-08)
Avail: NTIS HC A07/MF A01

A description of two recent GEC Avionics (GAv) systems is included: (1) A310 Slats and Flaps Control System; and (2) Jaguar FBW Demonstrator Flight Control System. Particular reference is made to the architecture of the computers and embedded software. Data is included on the two different system design requirements, especially those relating to integrity and availability. Emphasis is placed on the reasons for selecting dissimilarity, as an implementation philosophy, for the A310 system, as against the multiple similar Jaguar demonstrator architecture. The paper then provides a brief description of the design and development program for the two computer units with emphasis on lessons learned, specially in the software areas. The aspects of the system and computer design involved with maintainability and reliability are detailed and current in-service experience discussed where applicable. Conclusions are drawn particularly on dissimilarity, highlighting lessons learned from these successful FBW programs. A potential method of providing software fault tolerance within a dissimilar implementation is discussed and preliminary results of a GEC research program in this area provided.
Author

N86-20402# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
REDUNDANCY MANAGEMENT OF SYCHRONOUS AND ASYNCHRONOUS SYSTEMS c06
Gregory M. Papadopoulos *In* AGARD Fault Tolerant Hardware/Software Architecture Sep. 1985 15 p refs (For primary document see N86-20399 11-08)
Avail: NTIS HC A07/MF A01

While asynchronous systems may initially appear attractive due to the uncoupling the channels, the cross-channel interactions are much greater than what might be expected. Both synchronous and asynchronous systems share the burden of cross-channel consistency maintenance, the requirement that inputs and internal states are not allowed to diverge too far from each other. In fact, consistency maintenance often dominates the engineering process in a correctly designed system. In asynchronous systems, consistency maintenance takes the form of cross-channel equalization along with techniques for handling discrete changes in operating mode. In synchronous systems, consistency maintenance is implemented with source congruence algorithms. Synchronous and asynchronous systems must both support reliable resolution of redundant channel outputs, the process of isolating correct effectuator commands from faulty ones. A correctly designed synchronous system may rely on exact bit-for-bit voting to isolate faulty channels, while an asynchronous system must employ more heuristic means such as threshold and reasonableness tests. This research concludes that data synchronous principle is the approach of choice. the systems provide general purpose vehicles on which increasingly complex and diverse flight critical applications may execute.
Author

N86-20403# Newcastle-upon-Tyne Univ. (England). Computing Lab.
SOFTWARE FAULT TOLERANCE EXPERIMENTS c61
T. Anderson and P. A. Barrett *In* AGARD Fault Tolerant Hardware/Software Architecture Sep. 1985 5 p refs Sponsored in part by UK Science and Engineering Research Council and by the Ministry of Defence (For primary document see N86-20399 11-08)
Avail: NTIS HC A07/MF A01

A major experimental program has been undertaken in order to evaluate the effectiveness of software fault tolerance techniques in practical systems. This paper presents the results of phases two and three of these experiments, which indicate that the techniques can significantly enhance software reliability. The particular application used for these experiments was a naval command and control system, thus confirming that software fault tolerance can be successfully utilized in critical real-time systems.
Author

N86-20404# Newcastle-upon-Tyne Univ. (England). Computing Lab.
CAN DESIGN FAULTS BE TOLERATED? c61
T. Anderson *In* AGARD Fault Tolerant Hardware/Software

Architecture Sep. 1985 5 p refs (For primary document see N86-20399 11-08)
Copyright. Avail: NTIS HC A07/MF A01

The fault tolerant approach to building a reliable system acknowledges that perfection is impossible (or at best, very expensive) and therefore tries to cope with the consequences of residual defects within the system. Fault tolerance has an established role in detecting and masking component faults in hardware systems, but has also been advocated as a defense against deficiencies of design. This paper argues, in question and answer format, the case for adopting design fault tolerance techniques in practical systems. Author

N86-20405# Laboratoire d'Automatique et d'Analyse des Systemes, Toulouse (France).
DEPENDABLE AVIONIC DATA TRANSMISSION c06
D. R. Powell and J. C. Valadier *In* AGARD Fault Tolerant Hardware/Software Architecture Sep. 1985 19 p refs Sponsored in part by Direction des Recherches, Etudes et Techniques. Prepared in cooperation with Crouzet Aerospace and Systems, Valence, France, and Electronique Serge Dassault, St. Cloud, France (For primary document see N86-20399 11-08)
Avail: NTIS HC A07/MF A01

This paper outlines the major constraints imposed on the design of dependable local area networks for avionic systems and underlines the essential differences in requirements that exist with respect to those of ground-based (civil) LANs. The different choices available to the system designer are then discussed: technology (electrical or optical), architecture (bus or loop), general philosophy (centralized or decentralized), medium access control (competition or consultation). The paper then goes on to summarize two different and independent avionic LAN research projects; one which focusses on fault and damage-tolerance and the other on high-speed. Author

N86-20406# Honeywell Systems and Research Center, Minneapolis, Minn.
MULTI-COMPUTER FAULT TOLERANT SYSTEMS USING ADA c61
Walter L. Heimerdinger *In* AGARD Fault Tolerant Hardware/Software Architecture Sep. 1985 8 p refs (For primary document see N86-20399 11-08)
Avail: NTIS HC A07/MF A01

Ada will be the language of choice for a number of flight critical applications in the future. Ada incorporates a number of constructs to aid in constructing reliable software, including packages and private data types to manage the visibility of data and strong typing to control the values and operations that can be applied to a data object. Ada also provides constructs to assist in the construction of fault tolerant software. These include tasks and the Ada mechanisms for synchronizing and communicating between tasks, for exception handling and for timing. These mechanisms rely to a large degree on an Ada run time kernel, a set of routines to provide Ada features that can only be implemented while the application program is running. Since multiple computer architectures are often used for fault tolerant systems, the implementation of Ada software for multiple computers is an important consideration. Two ongoing projects illustrate the range of options for distributing Ada software on multiple computers. The first approach, which creates a separate Ada program for each computer, makes the least demands on the Ada compiler and run time software. The second approach, which treats all software for a multiple computer system as a single Ada program, requires a specialized Ada compiler and special distributed run time support routines, but separates software partitioning from the application programming. Author

N86-20407# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
DESIGN ISSUES IN DATA SYNCHRONOUS SYSTEMS c06
Gregory M. Papadopoulos *In* AGARD Fault Tolerant Hardware/Software Architecture Sep. 1985 12 p refs (For primary document see N86-20399 11-08)
Avail: NTIS HC A07/MF A01

Fault tolerant data synchronous systems are ones where the outputs of all correctly operating redundant channels are guaranteed to bit-for-bit agree, independent of whether the channels are clock, instruction or frame synchronous. Data synchronous systems offer a form of fault tolerant processing capable of correctly supporting a very general class of programs. In fact, the redundancy becomes relatively transparent to the programmer of applications for data synchronous systems, making them ideally suited for complex, algorithmically intensive programs that would be otherwise impossible to support. The various aspects of the design of correct data synchronous systems are examined in detail. These include: Source consistency, the requirement that all correctly operating channels receive precisely the same inputs, Event synchronization, the problem of keeping the time skew between channels within predetermined bounds, as well system initialization. The unsolved problem of latent faults is also presented along with the need for self-test heuristics. Sequential fault tolerant and parallel fault tolerant approaches are contrasted for systems requiring protection from multiple faults. Both hardware and software solutions to these problems are given, emphasizing system performance and economy. The paper concludes with the application of these techniques to the design of triplex fail-operational and quadruplex and dual-dual fail-operational-fail-operational systems. Author

N86-20408# Northrop Corp., Hawthorne, Calif. Aircraft Div.
DIGITAL FAULT-TOLERANT FLIGHT ACTUATION SYSTEMS c06
Howard H. Belmont *In* AGARD Fault Tolerant Hardware/Software Architecture Sep. 1985 19 p (For primary document see N86-20399 11-08)
(Contract F33615-80-C-3623)
(AFWAL-83-3041) Avail: NTIS HC A07/MF A01

A study was made of the equipments making up a typical flight control actuation system (servo electronics, servo valves, actuators and transducers) to determine where digital technology could replace analog technology for the purpose of providing a more fault-tolerant flight control actuation system. The investigation involved an analysis of where digital-to-analog conversion should take place between the light control computer and the analog control surface, and led to an evaluation of several architectural design issues. Among these were how to functionally partition the system, where to locate the servo electronics, the adequacy of military standard serial bus systems for control (versus data) applications, and the feasibility of providing electronics which could survive severe environments. Several actuation system configurations were evaluated. This led to recommending, as the best development prospect, a locally integrated actuation system consisting of servo electronics, servo valves, actuators, and transducers, interfacing with a digital flight control computer over a serial bus. Author

N86-20409# Honeywell Systems and Research Center, Minneapolis, Minn.
DESIGN VALIDATION OF FLY-BY-WIRE FLIGHT CONTROL SYSTEMS c06
Gary L. Hartmann, Joseph E. Wall, Jr., and Edward R. Rang *In* AGARD Fault Tolerant Hardware/Software Architecture Sep. 1985 17 p refs (For primary document see N86-20399 11-08)
Avail: NTIS HC A07/MF A01

This paper addresses the problem of design validation of fault tolerant architectures. Finite-state machines are used to formally specify flight control functions. Their application is not new to engineering practice in flight control. However, it is believed that their systematic and formal use to form the structure of the system specification will be an aid in the design phase and in the validation phase. Examples are used to illustrate their application to flight control specifications. The second portion of this paper is concerned with the problem of testing highly reliable systems. Models based on fault-trees in the early definition phase of estimating reliability are used to design tests to be performed at the iron bird state (hardware in-the-loop). Confidence in the overall

system reliability is derived from a combination of component life-tests and a careful evaluation of the faults that the system is designed to accommodate without loss of control. Author

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N86-20410# Federal Aviation Administration, Washington, D.C.
OBSTRUCTION MARKING AND LIGHTING
Oct. 1985 66 p
(AC-70/7460-1G) Avail: NTIS HC A04/MF A01

The Federal Aviation Administration's (FAA) standards for marking and lighting of obstructions as identified by FAA regulations part 77, are desribed. Provision's for marking and lighting wind turbines, towers, and moored balloons are given. R.J.F.

N86-20411# Royal Aircraft Establishment, Farnborough (England).
HIGH-PERFORMANCE GUN PROJECTORS OF 20-50mm CALISRE FOR LABORATORY EXPERIMENTS
G. Simon and G. Kukofka Jul. 1985 49 p refs Transl. into ENGLISH of "Systeme de Lancement de Laboratoire a Hautes Performances de Calibre 20 A 50 mm. Conception et Performances. VsubO=2000 m/s" rept. N-601-83 Franco-German Research Lab., Saint-Louis, France
(RAE-Trans-2135; BR98506; N-601-83) Avail: NTIS HC A03/MF A01

The design of a family of high-performance gun projectors of great flexibility and well-suited to laboratory experiments is described. For any given experiment a choice of barrels and chambers is available within the range of calibers between 20 and 50 mm and given muzzle velocities (V sub 0) of up to 2000 m/s for maximum chamber pressures of 600 MN/sq m. Propelling charges can be cased, combustible or caseless, initiation are effected electrically. The results of 10 year experience with the projector are given and compared with ballistics theory. Curves are presented to assist in the selection of the optimum gun projector for any particular application. E.A.K.

N86-20412*# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
FURTHER INVESTIGATION INTO CALIBRATION TECHNIQUES FOR A MAGNETIC SUSPENSION AND BALANCE SYSTEM Contractor Report, Jan. - Sep. 1985
J. Eskins Feb. 1986 44 p refs
(Grant NsG-7523)
(NASA-CR-178056; NAS 1.26:178056) Avail: NTIS HC A03/MF A01 CSCL 14B

Calibrations performed on three different magnetic cores for wind tunnel models suspended in the Southampton University Magnetic Suspension and Balance System (SUMSBS) are detailed. The first core investigated was the Southampton University pilot Superconducting Solenoid model, first flown in July 1983. Static calibrations of lift force, drag force and pitching moment, together with lift force and pitching moment calibrations determined by the dynamic method are detailed in this report. Other types of core investigated in a similar manner were conventional permanent magnets, Alnico and samarium-cobalt. All static calibrations gave a linear dependence of force on electromagnet current as expected. Dynamic calibrations are faster to perform but are proving to be not as easily analyzed as static calibrations. There are still some effects to be explained but dynamic lift calibration results were obtained agreeing to within 2 percent of the static calibration value. Author

N86-20413# Air Force Human Resources Lab., Brooks AFB, Tex.
FLIGHT SIMULATOR: EVALUATION OF SODERN VISUALIZATION SYSTEM SVS-14 Technical Paper, Jun. - Dec. 1984
Jost P. Gerlicher Sep. 1985 75 p
(AF Proj. 2363)
(AD-A161794; AFHRL-TP-85-11) Avail: NTIS HC A04/MF A01 CSCL 09/3

A solid crystal color light valve display system (to be used on flight simulators) has been developed by SODERN of France for the General Electric Company (GE) under an Air Force Human Resources Laboratory (AFHRL) contract. At the completion of the development phase, a prototype projector, designated as SODERN Visualization System SVS-14, was manufactured. The equipment underwent a series of acceptance tests at the SODERN facility in France and final acceptance testing at AFHRL, Williams AFB. The analysis of the test results showed that the SVS-14 met all important specifications and in some areas even exceeded them. Further experiments with the SVS-14 at AFHRL covered additional engineering evaluations and a human factors study. These tests consisted of a comparison demonstration between the SODERN SVS-14 and the GE PJ5155 projector. Ratings of the visual appearance of the imagery produced by the projectors on a side-by-side arrangement of rear projection screen were in favor of the GE system. However, it was soon found that the performance of the SODERN projector had degraded due to malfunctions of system components. This was caused by a power supply failure that had not been detected prior to the comparison tests. After extensive onsite repair efforts by SODERN personnel, the performance of the SVS-14 was again evaluated in a side-by-side comparison test with the PJ5155. The results indicated improvements in the quality of video imagery. The image persistence for fast moving objects was about equal for both projectors.
Author (GRA)

N86-20414# Sandia National Labs., Albuquerque, N. Mex.
STATUS OF THE DOE/SANDIA 500 KW VAWT TEST BED
H. M. Dodd 27 Aug. 1985 7 p Presented at WINDPOWER 85, San Francisco, Calif., 27 Aug. 1985
(Contract DE-AC04-76DP-00789)
(DE85-017225; SAND-85-1900C; CONF-850834-1) Avail: NTIS HC A02/MF A01

The DOE/Sandia Vertical Axis Wind Turbine (VAWT) Test Bed represents an evolutionary step in the development of larger and more efficient VAWT's. It is an advanced research machine whose purposes include prototype scale evaluations of improved aerodynamic designs, aerodynamic/structural loads determination for fatigue life improvements, and investigation of new operational modes to increase energy capture while maintaining or improving turbine life. The significant physical features of the machine include a rated power of 500 kW at 37.5 rpm in a 13.4 m/s (30 mph) wind, a diameter of 33.5 m (110 ft), and a height to diameter ratio of 1.25. Significant technological features include blades with multiple laminar airfoil shapes and multiple chord lengths, tailored aerodynamic performance and loads, and variable speed operating capability. The Test Bed will be assembled and operated at the USDA's Agricultural Research Service facility in Bushland, Texas, by Sandia and USDA personnel. Initial operation is scheduled for the fall of 1986. DOE

N86-20415# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Fluid Dynamics Panel.
SPECIAL COURSE ON CRYOGENIC TECHNOLOGY FOR WIND TUNNEL TESTING
Loughton, England Jul. 1985 408 p refs Course held in Rhode-Saint-Genese, Belgium, 22-26 Apr. 1985; sponsored by the Von Karmen Inst. and AGARD
(AGARD-R-722; ISBN-92-835-1506-4) Avail: NTIS HC A18/MF A01

Following a brief review of the development and early application of cryogenic wind tunnels, the 16 lectures examine the following aspects of cryogenic wind tunnel technology related to the design and operation of cryogenic tunnels: cryogenic engineering and safety, properties of materials at cryogenic temperatures, model

design requirements and fabrication techniques, instrumentation for control and data acquisition, data accuracy, productivity, and costs of models and operation. A review of the status of cryogenic wind tunnel projects is also presented. For individual titles, see N86-20416 through N86-20431.

N86-20416# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
INTRODUCTION TO CRYOGENIC WIND TUNNELS c31
M. J. Goodyer *In* AGARD Special Course on Cryogenic Technology for Wind Tunnel Testing Jul. 1985 11 p refs Previously announced in IAA as N86-12238 (For primary document see N86-20415 11-09)
Avail: NTIS HC A18/MF A01

The background to the evolution of the cryogenic wind tunnel is outlined, with particular reference to the late 60's/early 70's when efforts were begun to re-equip with larger wind tunnels. The problems of providing full scale Reynolds numbers in transonic testing were proving particularly intractible, when the motion of satisfying the needs with the cryogenic tunnel was proposed, and then adopted. The principles and advantages of the cryogenic tunnel are outlined, along with guidance on the coolant needs when this is liquid nitrogen, and with a note on energy recovery. Operational features of the tunnels are introduced with reference to a small low speed tunnel. Finally the outstanding contributions are highlighted on the 0.3-Meter Transonic Cryogenic Tunnel (TCT) at NASA Langley Research Center, and its personnel, to the furtherance of knowlege and confidence in the concept. Author

N86-20417*# Applied Cryogenics and Materials Consultants, New Castle, Del.
BASIC CRYOGENICS AND MATERIALS c31
D. A. Wigley *In* AGARD Special Course on Cryogenic Technology for Wind Tunnel Testing Jul. 1985 18 p refs Previously announced in IAA as N85-32215 Sponsored in part by NASA (For primary document see N86-20415 11-09)
Avail: NTIS HC A18/MF A01 CSCL 13B

The effects of cryogenic temperatures on the mechanical and physical properties of materials are summarized. Heat capacity and thermal conductivity are considered in the context of conservation of liquid nitrogen, thermal stability of the gas stream, and the response time for changes in operating temperature. Particular attention is given to the effects of differential expansion and failure due to thermal fatigue. Factors affecting safety are discussed, including hazards created due to the inadvertent production of liquid oxygen and the physiological effects of exposure to liquid and gaseous nitrogen, such as cold burns and asphyxiation. The preference for using f.c.c. metals at low temperatures is explained in terms of their superior toughness. The limitations on the use of ferritic steels is also considered. Nonmetallic materials are discussed, mainly in the context of their LOX compatibility and their use in the form of foams and fibers as insulatants, seals, and fiber reinforced composites. Author

N86-20418*# Applied Cryogenics and Materials Consultants, New Castle, Del.
MATERIALS AND TECHNIQUES FOR MODEL CONSTRUCTION c26
D. A. Wigley *In* AGARD Special Course on Cryogenic Technology for Wind Tunnel Testing Jul. 1985 19 p refs Previously announced in IAA as N85-31066 Sponsored in part by NASA (For primary document see N86-20415 11-09)
Avail: NTIS HC A18/MF A01 CSCL 14B

The problems confronting the designer of models for cryogenic wind tunnel models are discussed with particular reference to the difficulties in obtaining appropriate data on the mechanical and physical properties of candidate materials and their fabrication technologies. The relationship between strength and toughness of alloys is discussed in the context of maximizing both and avoiding the problem of dimensional and microstructural instability. All major classes of materials used in model construction are considered in some detail and in the Appendix selected numerical data is given for the most relevant materials. The stepped-specimen program to investigate stress-induced dimensional changes in alloys is discussed in detail together with interpretation of the initial results. The methods used to bond model components are considered with particular reference to the selection of filler alloys and temperature cycles to avoid microstructural degradation and loss of mechanical properties. Author

N86-20419*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DESIGN AND CONSTRUCTION OF MODELS FOR THE NATIONAL TRANSONIC FACILITY, PART 1 c26
Clarence P. Young, Jr. *In* AGARD Special Course on Cryogenic Technology for Wind Tunnel Testing Jul. 1985 17 p refs Sponsored in part by NASA (For primary document see N86-20415 11-09)
Avail: NTIS HC A18/MF A01 CSCL 11F

The design and construction of models for the National Transonic Facility (NTF) has resulted in significant technology developments in many areas. This lecture covers the development of design criteria and major research and development work that has contributed to the successful design and fabrication models for testing at full scale Reynolds number the NTF. Emphasis is placed on the materials aspect of the design and fabrication proces, including metallic materials, mechanical properties characterization, new steel alloy development, fracture toughness enhancement, and identification of fillers and solders suitable for use in cryogenic models. Quantitative data are provided which will be of value to the potential user of NTF or for application to the design and fabrication of model systems for other cryogenic wind tunnels. Author

N86-20420*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DESIGN AND CONSTRUCTION OF MODELS FOR THE NATIONAL TRANSONIC FACILITY, PART 2 c05
Clarence P. Young, Jr. *In* AGARD Special Course on Cryogenic Technology for Wind Tunnel Testing Jul. 1985 16 p refs Sponsored in part by NASA (For primary document see N86-20415 11-09)
Avail: NTIS HC A18/MF A01 CSCL 17G

This lecture presents the results of fastener load and retention systems tests which were carried out as a part of the cryogenic models technology development program a the NASA Langley Research Center (LaRC). Various design concepts for the National Transonic Facility (NTF) developmental and production models are discussed. A number of NTF models are described with emphasis on materials used, uniqueness of design and design drivers. Design and fabrication experience is presented in terms of the primary thermal and mechanical considerations required for design as well as fabrication. Cost considerations are addressed in terms of factors influencing costs for NTF models and cost data comparisons which are taken from both NASA Langley and industry experience. Author

N86-20421# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
CRYOGENIC WIND TUNNEL INSTRUMENTATION c35
M. Bazin *In* AGARD Special Course on Cryogenic Technology for Wind Tunnel Testing Jul. 1985 28 p refs Previously announced in IAA as A85-47284 (For primary document see N86-20415 11-09)
Avail: NTIS HC A18/MF A01

Research conducted under the European Wind Tunnel project with the objective of adapting wind tunnel instrumentation to cryogenic conditions is reviewed. In particular, attention is given to the development of cryogenic balances, pressure transducers, accelerometers, temperature transducers, skin friction gages, and instruments for attitude and deformation measurements. Model instrumentation and model motorization are also discussed. V.L. (IAA)

N86-20422# Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France).
FUNDAMENTAL REFLECTIONS ON CRYOGENIC TESTING c02

Andre Mignosi *In* AGARD Special Course on Cryogenic Technology for Wind Tunnel Testing Jul. 1985 25 p refs (For primary document see N86-20415 11-09)
Avail: NTIS HC A18/MF A01

This paper concerns a number of aerodynamic problems related to cryogenic testing but which can also be encountered during testing at room temperature. The first part describes the various factors involved to achieve the best similarity possible between an aircraft in flight and the model in the wind tunnel. The second part covers the analysis of these factors: effects of a non adiabatic wall, boundary layer transition, two-dimensional testing, effects of the Reynolds number. In the paper, an attempt is made to alternate theoretical considerations with practical examples in order to illustrate the importance of experimental/theoretical correlations. Finally, the paper endeavors to highlight a few areas to which effort must be devoted in the future so that the new technique of cryogenic wind tunnels now available to scientists and manufacturers provides reliable and accurate results leading to a better analysis of aerodynamic phenomena and improved prediction and optimization of aircraft performance. Author

N86-20423# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
PRODUCTIVITY: THE ECONOMIC ASPECTS OF CRYOGENIC WIND TUNNEL DESIGN AND USE c83
J. Christophe *In* AGARD Special Course on Cryogenic Technology for Wind Tunnel Testing Jul. 1985 21 p refs (For primary document see N86-20415 11-09)
Avail: NTIS HC A18/MF A01

The idea of productivity, as it is applied to large non-cryogenic wind tunnels is investigated. These considerations can be extended to the new cryogenic wind tunnels; but these have some special features we attempt to define precisely. Important focal points in designing a cryogenic wind tunnel or good productivity in operation are examined. Author

N86-20424# Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France). Dept. dAerothermodynamique.
THE T2 CRYOGENIC INDUCTION TUNNEL IN TOULOUSE c02
Jean-Bernard Dor *In* AGARD Special Course on Cryogenic Technology for Wind Tunnel Testing Jul. 1985 22 p refs (For primary document see N86-20415 11-09)
Avail: NTIS HC A18/MF A01

This paper summarizes the main results obtained by the experimental activity at the ONERA/CERT T2 induction tunnel in Toulouse since it was converted for cryogenic operation in 1981. It describes the main characteristics of this facility, operating by short pressurized transonic runs driven by induction, with a test section equipped with two self-adapting walls and its adaptation to cold flows: internal thermal insulation, cooling by injection of liquid nitrogen, system for precooling profile models and introducing them in the test section. The following subjects concerning cryogenic operation are then discussed: pressure and temperature fluctuations, thermal behavior of the walls, transverse temperature distributions in the flow, thermal equilibrium of a profile with the fluid, condensation phenomena in the cold flow and problems of particles. Finally, the test results at high Reynolds number conducted on a CAST 7 profile with a 150 mm chord are given. Author

N86-20425# Aerodynamische Versuchsanstalt, Goettingen (West Germany). Inst. fuer Experimentelle Stroemungamechanik.
THE CRYOGENIC LUDWIEG TUBE TUNNEL AT GOETTINGER c02
G. Hefer *In* AGARD Special Course on Cryogenic Technology for Wind Tunnel Testing Jul. 1985 6 p refs (For primary document see N86-20415 11-09)
Avail: NTIS HC A18/MF A01

At the Research Center Gottingen of the DFVLR a cryogenic Ludwieg tube wind tunnel for transonic operation is under construction. The tunnel, having an effective run time of 1 second, a test section of 0.4 x 0.35 sq m, and a stagnation pressure of 10 bars, is to be operated with nitrogen at temperatures between ambient and 120 K, achieving a Reynolds number of 70 x 10 to the 6th power based on a model chord of 0.15 m. In addition to reviewing the Ludwieg tube concept, this paper presents the main features of design and operation of the tunnel. Author

N86-20426# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).
THE KRYO-KANAL-KOELN (KKK) PROJECT: DESCRIPTION OF TUNNEL CONVERSION, INSULATION, CONTROLS, INSTRUMENTATION, OPERATIONAL EXPERIENCE AND FIRST PRELIMINARY TEST RESULTS c02
G. Viehweger *In* AGARD Special Course on Cryogenic Technology for Wind Tunnel Testing Jul. 1985 20 p refs Previously announced in IAA as A85-40314 (For primary document see N86-20415 11-09)
Avail: NTIS HC A18/MF A01

The fundamental principles, costs, and operational phases (cooldown, preparation, starting, measurement, rundown, and warming) of cryogenic wind tunnels are discussed, and the problems encountered in modifying the conventional low-speed wind tunnel at Cologne for cryogenic operation are discussed. Particular attention is given to the test section, the blowers and power plant, the liquid-N2 system, the exhaust and safety system, and the interior insulation; and photographs, drawings, and diagrams are provided. The first trial operation of the KKK took place in September 1984, with calibration under cryogenic conditions scheduled for the second half of 1985. T.K. (IAA)

N86-20427# National Aerospace Lab., Amsterdam (Netherlands). Technical Group ETW.
THE EUROPEAN TRANSONIC WINDTUNNEL (ETW) PROJECT
J. A. Tizard and J. P. Hartzuiker *In* AGARD Special Course on Cryogenic Technology for Wind Tunnel Testing Jul. 1985 23 p refs Previously announced in IAA as N84-23566 (For primary document see N86-20415 11-09)
Avail: NTIS HC A18/MF A01

The status of the preliminary design phase of the European Transonic Wind Tunnel project is described. The latest version of the proposed tunnel is given together with some details of its estimated performance. Some features of the tunnel which were revised following the first preliminary design proposals are discussed and the results of an investigation into the expected future use of the tunnel are summarized. An aerodynamic circuit test-rig is described along with some of the results obtained. Information on the pilot tunnel is included as well as reference to the supporting program on cryogenic technology. Author

N86-20428*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE NASA LANGLEY 0.3-M TRANSONIC CRYOGENIC TUNNEL
Robert A. Kilgore *In* AGARD Special Course on Cryogenic Technology for Wind Tunnel Testing Jul. 1985 15 p refs Sponsored in part by NASA (For primary document see N86-20415 11-09)
Avail: NTIS HC A18/MF A01 CSCL 14B

The Langley 0.3-m Transonic Cryogenic Tunnel (0.3-m TCT) can operate from ambient to cryogenic temperatures at absolute pressures from 1 to 6 bars. Since the 0.3-m TCT began operation in 1973, it has been used to develop instrumentation and operating techniques for cryogenic tunnels as well as for aerodynamic tests where advantage can be taken of the extremely wide range of Reynolds number available. This paper describes the present capabilities of the 0.3-m TCT and gives an overview of recent research activities which include both steady and unsteady testing. Emphasis is given to safety and the development of testing techniques for cryogenic tunnels. Results of studies aimed at establishing the lower limits of operating temperature are presented and the impact of these studies on tunnel operation is discussed. Finally, the design features and operating characteristics of a new self-streamlining wall test section recently installed in the tunnel circuit are described. Author

N86-20429*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE US NATIONAL TRANSONIC FACILITY, PART 1
Walter E. Bruce, Jr. *In* AGARD Special Course on Cryogenic Technology for Wind Tunnel Testing Jul. 1985 10 p refs Sponsored in part by NASA (For primary document see N86-20415 11-09)
Avail: NTIS HC A18/MF A01 CSCL 14B

The construction of the National Transonic Facility was completed in September 1982, and checkout operations started the following month, with the maximum Reynolds number being obtained in May 1983. Following, most of the effort was devoted to installing the model access housings, and adjusting or altering various tunnel hardware systems. In May 1984, preliminary aerodynamic calibration of the tunnel was initiated in parallel with checkout of the tunnel operating systems, and in August 1984, the tunnel was declared operational and turned over to the user organization for a complete aerodynamic calibration and research and development testing. The facility has been operated in both the air and nitrogen modes covering a Mach number range of 0.2 to 1.22 at pressures up to 8.5 atm and at temperatures down to 100K. This paper presents a status of the tunnel operating systems and an overview of the major milestones during checkout. Author

N86-20430*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE US NATIONAL TRANSONIC FACILITY, PART 2
Walter E. Bruce, Jr. *In* AGARD Special Course on Cryogenic Technology for Wind Tunnel Testing Jul. 1985 10 p refs Sponsored in part by NASA (For primary document see N86-20415 11-09)
Avail: NTIS HC A18/MF A01 CSCL 14B

The construction of the National Transonic Facility was completed in September 1982, and checkout operations started the following month with the maximum Reynolds number being obtained in May 1983. Afterwards, effort was primarily devoted to installing the model access housings and adjusting or altering various tunnel hardware systems. In May 1984, the aerodynamic calibration started and was performed in parallel with checkout of the tunnel systems. In August 1984, the final operation readiness review was conducted and the facility declared operational for research testing. The facility has been operated in both air and nitrogen modes covering a Mach number range of 0.2 to 1.22 at pressures up to 8.5 atm and at temperatures doen to 100K. A limited amount of tunnel circuit performance information has been obtained and is presented in this paper. An aerodynamic calibration plan has been outlined, and the first part of the steady-state calibration has been completed, of which some results are presented in this paper. The first aerodynamic vehicle, Pathfinder I, was installed in December 1984 for checkout of instrumentation systems, and a status report and some results are presented. Author

N86-20431*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
OTHER CRYOGENIC WIND-TUNNEL PROJECTS
Robert A. Kilgore *In* AGARD Special Course on Cryogenic Technology for Wind Tunnel Testing Jul. 1985 15 p refs Sponsored in part by NASA (For primary document see N86-20415 11-09)
Avail: NTIS HC A18/MF A01 CSCL 14B

Following the development of the cryogenic wind tunnel at the NASA Langley Research Center in 1972, a large number of cryogenic wind-tunnel projects have been undertaken at various research establishments around the world. Described in this lecture are cryogenic wind-tunnel projects in China (Chinese Aeronautical Research and Development Center), England (College of Aeronautics at Cranfield, Royal Aircraft Establishment - Bedford, and University of Southampton), Japan (National Aerospace Laboratory, University of Tsukuba, and National Defense Academy), Sweden (Rollab), and the United States (Douglas Aircraft Co., University of Illinois at Urbana-Champaign, and NASA Langley). Author

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N86-20432# Committee on Science and Technology (U. S. House).
ASSURED ACCESS TO SPACE DURING THE 1990'S
Washington GPO 1985 187 p Joint hearings before the Subcommittee on Space Science and Applications of the Committee on Science and Technology and the Subcommittee on Research and Development of the Committee on Armed Services, 99th Congress, 1st Session, no. 51, HASC no. 99-9, 23-25 Jul. 1985 Prepared in cooperation with Committee on Armed Services, US House
(GPO-53-617) Avail: Subcommittee on Space Science and Applications

Hearings on the subject of assured access to space during the 1990's is presented. During the past 27 years, activities in outer space have become increasingly important to the national security, to the economic well being, to the quality of life, and to the rate of technological growth of the United States. In the past year, NASA and the Defense Department have reached agreements on how to best meet the space launch needs for the rest of this decade. Additionally, work has begun on studies of the next generation of space transportion. However, these next generation systems may not be available until about the year 2000 or beyond. Accordingly, decisions must soon be reached on how existing systems and technologies will be procured and operated to meet all of the space transportation needs of the 1990's. This subject is the focus of these hearings. Author

N86-20433*# Texas Univ., Dallas. Center for Space Sciences.
DE-1 PHASE 3 EXTENDED MISSION DATA ANALYSIS OF DYNAMICS EXPLORER RETARDING ION MASS SPECTROMETER FLIGHT DATA Final Report, 25 Ja. - 24 Nov. 1985
5 Dec. 1985 7 p
(NASA Order H-78173B)
(NASA-CR-178704; NAS 1.26:178704) Avail: NTIS HC A02/MF A01 CSCL 22A

Field-aligned motion of ionospheric ions at a low altitudes and different pitch angle distributions of ionospheric ions at high altitudes were studied. The objective is twofold: (1) to discover the degree to which observations made by Dynamics Explorer 1 (DE-1) and DE-2 agree when taken in the same ionospheric volume; (2) to understand the processes operating along a magnetic field tube connecting DE-1 and DE-2 that allow a reconciliation of the two data sets. A second investigation has two facets; to reconcile the observed occurrence of ionospheric ions at high altitudes with a point source injection in the ionosphere and subsequent E x B drift, and to reconcile the observed fluxes of ionospheric ions at high altitudes with the measured upward flux at low altitudes. An understanding of the effects of E x B drift molten on the dispersion of ionospheric ions is attained. E.A.K.

N86-20434*# Universities Space Research Association, Columbia, Md.
REVIEW AND EVALUATION OF SPACE PROCESSING APPLICATIONS Final Report
7 Jan. 1986 21 p refs
(Contract NAS8-35768)
(NASA-CR-178703; NAS 1.26:178703) Avail: NTIS HC A02/MF A01 CSCL 22A

Materials research in space which offers advantages in studying phenomena and preparing materials under conditions which cannot be realized in the gravity field of the Earth is discussed. Many techniques were developed to improve processing systems and reduce the effect of gravitationally induced restrictions. The space-based devices take advantage of a wide range of low-gravity facilities including drop towers and tubes, aircraft and sounding rocket parabolic trajectories, simple materials experiment accommodations in the Space Shuttle, and more complex capabilities in Spacelab. All these systems are used to produce novel

materials and to study material processing under unique conditions. E.A.K.

N86-20435*# Stanford Univ., Calif. Space, Telecommunications and Radioscience Lab.
DYNAMICS-A EXPLORER RIMS DATA ANALYSIS Interim Final Report, 17 Sep. 1981 - 30 Sep. 1985
P. M. Banks and C. R. Clauer Sep. 1985 6 p
(Contract NAS8-34430)
(NASA-CR-178689; NAS 1.26:178689) Avail: NTIS HC A02/MF A01 CSCL 22A

Activities of the RIMS instrument during the extended mission are planned. The modes of operation for RIMS to achieve the science requirements utilizing the new and exciting information on the composition and dynamics of the low energy (0-50eV) ions in the Earth's ionosphere and magnetosphere are determined. The specific science problems and the required RIMS operational modes needed to acquire the desired data are identified. The analysis was performed on the RIMS data to achieve the science results and this new information was used in determining RIMS operations during the latter part of the mission. Necessary sensitivity tests of RIMS operating modes and instrument performance was suggested. The inflight results was compared with theoretical models. E.R.

N86-20436# Committee on Science and Technology (U. S. House).
SPACE SCIENCE: PAST, PRESENT AND FUTURE
Washington GPO 1985 210 p Hearings before the Subcommittee on Space Science and Applications of the Committee on Science and Technology, 99th Congress, 1st Session, no. 60, 8-10 Oct. 1985
(GPO-55-239) Avail: Subcommittee on Space Science and Applications CSCL 22A

The Congressional Subcommittee on Space Science and applications held hearings on Space Science: past, present and future. Topics discussed include: space sciences and exploration, space physics, Earth observations from space, Earth sciences, planetary and solar system formation, weather observations from space, biology studies from space, solar system space physics, and solar-terrestrial sciences. E.A.K.

N86-20437# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE
10 Feb. 1986 97 p refs Transl. into ENGLISH from various Russian articles
(JPRS-USP-86-002) Avail: NTIS HC A05

Aerospace sciences and its applications in the U.S.S.R. is reported. Manned missions, interplanetary exploration, extraterrestrial intelligence, space processing are some of the topic areas explored. For individual titles, see N86-20438 through N86-20456.

N86-20438# Joint Publications Research Service, Arlington, Va.
WORLD'S LARGEST CAMERA FOR SATELLITE OBSERVATION INSTALLED AT ZVENIGOROD c35
M. Rogozhnikov *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 18-19 Transl. into ENGLISH from Leninskoye Znamya (Moscow, USSR), 17 Oct. 1985 p 4 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

The world's largest camera for observing artificial Earth satellites was installed at the Zvenigorod station of the USSR Academy of Sciences' Astronomical Council. Small deviations of geostationary satellites from their prescribed orbits sometimes occur. At regular intervals, it is necessary to give them a push—to correct their orbits. The photographing of satellites from Earth is still the most precise and accurate method for determining their coordinates. The camera was installed near Zvenigorod for this purpose. Author

N86-20439# Joint Publications Research Service, Arlington, Va.
SOME POSSIBILITIES OF REPRESENTATION OF GRAVITATIONAL POTENTIAL BY SERIES ALWAYS CONVERGENT OUTSIDE ITS SURFACE c64
N. A. Chuykova *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 28 Transl. into ENGLISH from Vestnik Moskovskogo Universiteta: Fizika, Astronomiya (Moscow, USSR), v. 26, no. 5, Sep. - Oct. 1985 p 77-81 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

In processing surface and satellite gravimetric data the problem usually arises as to the possibility of using a single Laplace series for the representation of geopotential and its derivatives because the convergence of this series everywhere outside the planetary surface has been demonstrated only for a certain class of surfaces. For a surface of arbitrary form this problem can be solved by applying the Runge-Krarup theorem. An analysis of this problem indicates that planetary potential can be uniformly represented everywhere in the region of its analyticity in the form of the limit of sums of spherical functions a form given. The coefficients on the spherical functions are quite dependent on the number of the approximation and on the region of observations. Since in the satellite region the Laplace series gives the best quadratic approximation for potential, in processing satellite data alone it is impossible to obtain the proposed universal models. A satellite model cannot be used for a surface not conforming to the conditions of convergence of a Laplace series on it. The proposed universal model can be obtained using either joint satellite and surface observations or surface data alone. Author

N86-20440# Joint Publications Research Service, Arlington, Va.
PROBOS MISSION DISCUSSED AT INTERNATIONAL COMMITTEE MEETING c18
V. Ovcharov *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 29 Transl. into ENGLISH from Sovetskaya Moldaviya (Kishinev, USSR), 15 Nov. 1985 p 3 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

The carrying out of a new international project, Phobos, will become an important step in the study of planets of the solar system. This project calls for launching two Soviet automatic stations in 1988, for the purpose of studying the planet Mars and its satellites Phobos and Deimos. Preparations for this unique space experiment are being discussed at a meeting of the international scientific and technical committee for the Vega project. The two Phobos automatic interplanetary stations are to be launched from the Baykonur Cosmodrome in July of 1988. The launches will be separated by an interval of several days. Each spacecraft will carry 30 instruments on board. It will take the stations about 7 months to make the trip to Mars. They will be approaching the planet early in 1989. Plans call for photographing the surfaces of Mars and its satellites and for studying the Martian atmosphere and the planet's magnetic field in the course of the experiment. The landing of small probes with instruments on Phobos is also proposed. Author

N86-20441# Joint Publications Research Service, Arlington, Va.
SAGDEYEV ON INTERNATIONAL TRACKING, PROCESSING OF VEGA BALLOON PROBE c91
In its USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 30-32 Transl. into ENGLISH from Pravda (Moscow, USSR), 27 Aug. 1985 p 3 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

Within the framework of the international project Vega, which is opening an era of fundamentally new research on the atmosphere of Venus and also a program of studying the small bodies of the solar system--the comets and steroids, the Soviet spacecraft Vega-1 and Vega-2 inserted two balloon probes into the atmosphre of Venus, in addition to their landers. The main task of the balloon experiment was to obtain new information about the dynamics of the atmosphere of Venus. A sonde, unlike a lander, makes it possible to conduct measurements over various sectors of the planet. Each balloon probe was operating for 46 hours and in this time flew with the wind over 12,000 kilometers, measuring along its flightpath the temperature, pressure, vertical gusts of wind, the range of visibility in the clouds, the average amount of illumination and following the presence of light flashes. The balloon

flights started from the middle of the planet's night region and finished their work on the daylight side. Author

N86-20442# Joint Publications Research Service, Arlington, Va.
RESULTS FROM VENUS CLOUD STUDIES ON VEGA CRAFT **c91**

V. Moroz and L. Mukhin *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 33-34 Transl. into ENGLISH from Pravda (Moscow, USSR), 18 Nov. 1985 p 8 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

Results of studies that were made of the clouds of Venus with the aid of the probes that were released by the automatic interplanetary stations Vega-1 and Vega-2 are reported. Each of the capsules that descended through Venus' atmosphere carried several instruments for measuring the chemical composition of cloud particles, the size particles and their distribution by altitude. Direct measurements of the content of sulfuric acid in cloud particles were made with Sigma-3 instrument on both capsules. Another experiment established that clouds of Venus also contain sulfur, chlorine, and apparently phosphorus, which was detected for the first time. Author

N86-20443# Joint Publications Research Service, Arlington, Va.
COMMENTARY ON 15TH LUNAR-PLANETARY CONFERENCE **c91**

V. V. Shevchenko *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 35-38 Transl. into ENGLISH from Zemlya I Vselennaya (Moscow, USSR), no. 6, Nov. - Dec. 1984 p 43-45 Conf. held at Houston, Tex., Mar. 1984 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

Every year in Houston there is a lunar-planetary conference, at which the current results of the work of scientists studying the solar system's bodies are summed up. The conference is organized by the U.S. Lunar-Planetary Institute of the University Association for Space Research and by NASA's Johnson Space Center. Originally the conferences were concerned only with lunar research. Later, as of March, 1978, the meetings' scientific program was expanded and began to include many other questions connected with the study of the solar system. Nearly 500 planetologists and scientists with allied specialities participated in the work of the 15th Lunar-Planetary Conference, which took place in March, 1984. In all, at 28 sectional meetings, almost 300 oral reports were heard and they touched on such themes as: the study of regoliths; the origin of the crust; lunar petrology; lunar geology; planetary physics; the study of isotopes; the study of meteorites; the study of shock crater formation; the satellites of the giant planets; Mars; Venus; the evolution of the solar system; asteroids and comets; and cosmic dust. Author

N86-20444# Joint Publications Research Service, Arlington, Va.
SHKLOVSKIY DISCUSSES POSSIBILITY OF EXTRATERRESTRIAL INTELLIGENCE **c51**

I. S. Shklovskiy *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 39-44 Transl. into ENGLISH from Zemlya I Vselennaya (Moscow, USSR), no. 3, May - Jun. 1985 p 76-80 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

The silence of the universe can be completely and naturally attributed to the fact that extraterrestrial civilizations have either perished, not being able to contend with the problems that arose in the course of their own development, or there have never been such civilizations. In an examination of the history of terrestrial civilization it is seen that there are global problems in the present era and an inability to solve them can lead mankind to destruction. The proposed hypothesis makes possible a more profound discussion of the board range of problems related to the future of mankind and the extent to which life occurs in the universe.
Author

N86-20445# Joint Publications Research Service, Arlington, Va.
SALYUT-7 ELECTROPHORESIS EXPERIMENTS AID MEDICAL RESEARCH **c51**

T. Chesanova *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 45 Transl. into ENGLISH from Leningradskaya Pravda (Leningrad, USSR), 13 Oct. 1985 p 2 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

Experiments performed by crews of Salyut orbiting stations have been aimed at obtaining extrapure hemagglutinin and other surface proteins of the influenza virus, using the method of electrophoresis. The series of space experiments called Tavriya demonstrated that such products can be obtained comparatively quickly and easily in conditions of zero gravity. A new generation electrophoretic unit called EFU-Robot is now in use on the Salyut-7 station. The EFU-Robot can be programmed by a cosmonaut to select samples of substances purified in the course of experiments and automatically transfer the samples from the unit's working chamber to ampoules, using syringes. Preparations obtained during the current manned orbital mission were delivered to Earth recently by cosmonauts. Author

N86-20446# Joint Publications Research Service, Arlington, Va.
RADAR OBSERVATIONS OF RIVER OVERFLOWS FROM OUTER SPACE Abstract Only **c43**

A. P. Pichugin, A. S. Gavrilenko, A. G. Gribunin, L. V. Yelenskiy, A. I. Kalmykov, and V. P. Shestopalov *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 63 Transl. into ENGLISH from Doklady Akademii Nauk SSSR (Moscow, USSR), v. 284, no. 2, Sep. 1985 p 323-326 Original language translation was announced in IAA as A86-13984 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

Cosmos-1500 sidelooking radar observations of the flooding of the Amur River in August 1984 are examined. It is concluded that remote-sensing radar images can be effectively used to monitor river flooding and to identify the basic features of flooded regions. The proposed radar-image processing method makes it possible to compute the areas of regions with different degrees of flooding as well as the percentage of land under water. B.J.

N86-20447# Joint Publications Research Service, Arlington, Va.
VARIABILITY OF ATMOSPHERIC TRANSFER FUNCTION COMPONENTS Abstract Only **c47**

O. M. Pokrovskiy, V. M. Prokhorov, and T. F. Pchelova *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 64 refs Transl. into ENGLISH from Issledovaniye Zemli IZ Kosmosa (Moscow, USSR), no. 4, Jul. - Aug. 1985 p 9-20 Original language document was announced in IAA as A86-13277 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

Atmospheric transfer functions have been computed for the spectral band 0.4-0.9 microns, assuming the optical thickness of the atmospheric boundary layer is variable. The sensitivity of the transfer functions to variations in the optical characteristics of the aerosol was analyzed, and the results are used to predict optimal times for satellite observations of the Earth surface when the influence of the atmosphere on spectrometric data is minimal. Estimates of the optical thickness of the aerosol in the troposphere are given in a table. I.H.

N86-20448# Joint Publications Research Service, Arlington, Va.
OPTICAL THICKNESS OF ATMOSPHERIC AEROSOL OVER SEA Abstract Only **c74**

K. S. Shifrin, V. M. Volgin, B. N. Volkov, O. A. Yershov, and A. V. Smirnov *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 65 Transl. into ENGLISH from Issledovaniye Zemli Iz Kosmosa (Moscow, USSR), no. 4, Jul. - Aug. 1985 p 21-30 Original language document was announced in IAA as A86-13278 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

Measurements of the optical depth of the atmospheric aerosol over marine and coastal regions are presented. The measurements were carried out using a photoelectric amplifier and a photodiode detector having a combined sensitivity in the range 300-1016 nm.

The measured data were cross correlated using the Burder method and the results are discussed. It is shown that the two sets of measurements have good correlation in the visible band (300-500 nml, and in the infrared (500-1016 nm). The estimated optical depths are given in a table. I.H.

N86-20449# Joint Publications Research Service, Arlington, Va.
NEW METHOD FOR GEOLOGICAL INTERPRETATION OF ANNULAR STRUCTURES WITHIN COVERED AND PARTIALLY COVERED AREAS Abstract Only **c46**
B. S. Zeylik, L. G. Perfilyev, A. N. Vasilenko, and E. Yu. Seytmuratova *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 66 Transl. into ENGLISH from Issledovaniye Zemli Iz Kosmosa (Moscow, USSR), no. 4, Jul. - Aug. 1985 p 31-40 Original language document was announced in IAA as A86-13279 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

Digital modelling of topographic features in low angle sunlight is proposed to identify ring structures in remote sensing images. The technique was used to construct a relief image of the Shunak crater based on satellite measurements of solar irradiance in four directions. A map of the Shunak crater, showing the isolines of the total solar irradiance is provided. I.H.

N86-20450# Joint Publications Research Service, Arlington, Va.
STUDY OF SPATIAL STRUCTURE OF SOIL COVER IN BAYKAL REGION USING AEROSPACE PHOTOGRAPHS Abstract Only **c43**
V. A. Kuzmin *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 67 Transl. into ENGLISH from Issledovaniye Zemli Iz Kosmosa (Moscow, USSR), no. 4, Jul. - Aug. 1985 p 53-57 Original language document was announced in IAA as A86-13282 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

Soil cover and its changes can be studied best by using aerospace materials. It is best that soil regions be defined on photographs at 1:2,500,000. An example of a soils geography regionalization map, compiled from photographs at this scale, is illustrated. Regions are defined within the limits of plateaus, plains, high, intermediate and low mountains and basins. Photographs at 1:1,000,000 yield considerably more information; in addition to provinces and regions it is possible to define landscape units. Among the different photographic scales used the most detailed were intermediate scale photographs on which it is possible to discriminate districts soil micro- and mesostructures and elementary soil areas. In contrast to space photographs on aerial photographs it is possible to discriminate vegetation, micro- and mesorelief, and in cultivated areas such soil characteristics as humus content, moisture content, calcareousness, etc. In the study of soils geography the soil cover is reflected through the structure of different levels of organization. Author

N86-20451# Joint Publications Research Service, Arlington, Va.
RADIATION CORRECTION FOR AEROSPACE IMAGES OF AGRICULTURAL CROPS Abstract Only **c43**
A. S. Barykin, V. V. Kozoderov, and V. P. Popov *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 68-69 Transl. into ENGLISH from Issledovaniye Zemli Iz Kosma (Moscow, USSR), no. 4, Jul. - Aug. 1985 p 78-85 Original language document was announced in IAA as A86-13285 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

The methods used to calculate radiative corrections in thematic processing of remotely-sensed agricultural images are reviewed. The effect of atmospheric turbidity on the accuracy of thematic classifications is estimated by comparing corrected and uncorrected images. A radiative correction algorithm is derived based on model estimates of radiative transfer in the atmosphere and an orthogonal polynomial approximation of outgoing radiation. It is found that the accuracy of image classifications increased when the effect of atmospheric turbidity was removed. Some examples of the processed imagery are provided. I.H.

N86-20452# Joint Publications Research Service, Arlington, Va.
IDENTIFICATION OF NATURAL FORMATIONS FROM RESULTS OF SPECTRAL-ENERGY MEASUREMENTS FROM SPACE Abstract Only **c46**
L. I. Kiselevskiy, A. A. Kovalev, and V. Ye. Plyuta *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 69-70 Transl. into ENGLISH from Issledovaniye Zemli Iz Kosmosa (Moscow, USSR), no. 4, Jul. - Aug. 1985 p 98-104 Original language document was announced in IAA as A86-13287 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

Photographs obtained on board the orbital station Salyut-4 were used to study the spectral and energy characteristics of the upper boundary layer over selected regions of the USSR. The influence of the sample volume on the statistical classifications for spectral features in the range 0.4-0.8 microns is examined in detail. The most informative spectral features were chosen according to Shannon's criterion of information content. A list of the spectral classifications is given. I.H.

N86-20453# Joint Publications Research Service, Arlington, Va.
CLASSIFICATION OF NATURAL FORMATIONS BASED ON THEIR OPTICAL CHARACTERISTICS USING SMALL VOLUMES OF SAMPLES Abstract Only **c46**
N. S. Abramovich, A. A. Kovalev, and V. Ye. Plyuta *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 70 Transl. into ENGLISH from Issledovaniye Zemli Iz Kosmosa (Moscow, USSR), no. 4, Jul. - Aug. 1985 p 105-111 Original language document was announced in IAA as A86-13288 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

A computer algorithm has been developed to classify the spectral bands of natural scenes on Earth according to their optical characteristics. The algorithm is written in FORTRAN-IV and can be used in spectral data processing programs requiring small data loads. The spectral classifications of some different types of green vegetable canopies are given in order to illustrate the effectiveness of the algorithm. I.H.

N86-20454# Joint Publications Research Service, Arlington, Va.
ALLOWANCE FOR PROPERTIES OF BOUND MOISTURE IN REMOTE SENSING OF SOIL MOISTURE CONTENT Abstract Only **c43**
T. A. Sologubova and V. S. Etkin *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 71 Transl. into ENGLISH from Issledovaniye Zemli Iz Kosmosa (Moscow, USSR), no. 4, Jul. - Aug. 1985 p 112-115 Original language document was announced in IAA as A86-13289 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

It is shown that a distinction should be made between the dielectric properties of fixed and free water in interpretations of radiometer measurements of soil moisture content. Some elementary calculations of the free water content in different types of soil are carried out based on the published data and the results are discussed. It is suggested that taking into account the distinction between differences in the dielectric properties of free and fixed water deposits can increase the accuracy of soil moisture estimates in remote sensing surveys. I.H.

N86-20455# Joint Publications Research Service, Arlington, Va.
THE EXPLORATION OF OUTER SPACE AND THE DEVELOPING COUNTRIES **c43**
S. M. Monin *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 72-78 Transl. into ENGLISH from Zemlya I Vselennaya (Moscow, USSR), no. 4, Jul. - Aug. 1985 p 76-81 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

In many countries of Asia, Africa and Latin America ground communications systems still do not adequately cover large areas, and space technology is frequently the simplest and fastest means of setting up communications between regions within countries as well as with the outer world. Space television can play an important

part in overcoming illiteracy and raising the general educational and cultural standards of the people of such countries. Data received from outer space on meteorology, the state of farmlands and forests, and mineral deposits can facilitate the development of agriculture and the extracting industries, which constitute the developing countries' economic basis. Of considerable importance are navigation support, oceanic studies, and monitoring the environment. The development and operation of space hardware is extremely expensive. In most cases the level of industry, science and technology is not high enough. There are few experts capable of contributing to space projects. It is not surprising, therefore, that these countries account for only 5 percent of space-related world research and development. These and other space policy considerations are considered. Author

N86-20456# Joint Publications Research Service, Arlington, Va.
HISTORICAL OVERVIEW OF INTERCOSMOS PROGRAM c17
M. A. Rimsha *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 79-86 refs Transl. into ENGLISH from Zemlya I Vselennaya (Moscow, USSR), no. 6, Nov. - Dec. 1984 p 26-32 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

Fifteen years ago, on October 14, 1969, the artificial Earth satellite Intercosmos-1 was launched initiating joint satellite research conducted by scientists and specialists from friendly countries. A little more than 2 years were spent on the preparations for this launch. The first envoys of the Intercosmos program were comparatively small space vehicles. They consisted of three basic sections: a cylindrical middle section and two hemispheres. The first craft of the Intercosmos series achieved orientation on the Sun with an accuracy of a few angular degrees. The launch of the Intercosmos-1 satellite initiated one of the basic directions of research conducted in accordance with the program of space cooperation by the socialist countries--research on the solar-terrestrial ties using satellites. Author

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N86-20457# Royal Aircraft Establishment, Farnborough (England).
ORBIT DETERMINATION AND ANALYSIS FOR 1970-97B AT 14TH-ORDER RESONANCE
A. N. Winterbottom and D. G. King-Hele Jun. 1985 24 p
(AD-A160686; RAE-TR-85054; DRIC-BR-96950) Avail: NTIS HC A02/MF A01 CSCL 03/3

The orbit of the satellite 1970-97B, the rocket of Cosmos 378, at inclination 74 deg, has been determined at 18 epochs between April and August 1971, when the effects of 14th-order resonance with the Earth's gravitational field were appreciable. The orbits were determined with the PROP 6 program from Hewitt camera, kinetheodolite, US Navy and visual observations, and an average accuracy of 90 m in perigee distance was achieved, despite the low perigee height (near 230 km) and the consequent high drag. The orbits, together with 13 previously evaluated, have been analysed to reveal the effects of the 14th-order resonance and to evaluate six lumped geopotential harmonics of order 14. Because the orbit passed through resonance rapidly, the values are not as accurate as those from slow resonances; but they are more accurate than any others available for an inclination near 74 deg, and have proved their worth in a recent determination of individual 14th-order coefficients. Author (GRA)

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N86-20458# National Oceanic and Atmospheric Administration, Boulder, Colo.
[ACTIVITIES OF THE SPACE ENVIRONMENT LABORATORY, FY 1984] Annual Report, 1 Oct. 1983 - 30 Sep. 1984
H. Leinbach 1984 50 p refs
(PB85-226256) Avail: NTIS HC A04/MF A01 CSCL 04A

Topics including space environment services: current progress--(space environment services, forecast operations, real-time data and sources, communications for data collection, data display systems, distribution of service products, mechnical improvements in services, international data exchange); future plans--(services, technical improvements in services); research and development: current progress--(operational satellite instrumentation, SELSIS - Space Environment Laboratory Solar Imaging System, solar physics, interplanetary physics, magnetospheric physics, atmosphere-ionosphere-magnetosphere interactions; SELDADS II; SEL staff; Publications; SEL talks are presented. GRA

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N86-20459 British Aerospace Dynamics Group, Bristol (England). Human Factors and Vision Research Dept.
MODELS FOR A TARGET RECOGNITION SYSTEM IN MISSILES USING A COMPUTER AND SENSOR DEVICE
N. J. Puzey Nov. 1980 19 p refs
(BAe-BT-11140) Copyright. Avail: Issuing Activity

Shape recognition models are discussed and recommendations for the design of a computer guidance system for missiles are made. A model to account for shape discrimination by the Octopus visual system is the most heuristic in forming the basis of an automatic target acquisition system. A system based on a recognition template of hexagonal cell sensors is proposed; this can identify the same aspect of an object along the three axes of symmetry of the hexagon so the system is largely independent of object/sensor orientation. Author (ESA)

N86-20460*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
STAR 48 SOLID ROCKET MOTOR NOZZLE ANALYSES AND INSTRUMENTED FIRINGS
Robert L. Porter Mar. 1986 58 p refs
(NASA-TP-2572; NAS 1.60:2572) Avail: NTIS HC A04/MF A01 CSCL 21H

The analyses and testing performed by NASA in support of an expanded and improved nozzle design data base for use by the U.S. solid rocket motor industry is presented. A production nozzle with a history of one ground failure and two flight failures was selected for analyses and testing. The stress analysis was performed with the Champion computer code developed by the U.S. Navy. Several improvements were made to the code. Strain predictions were made and compared to test data. Two short duration motor firings were conducted with highly instrumented nozzles. The first nozzle had 58 thermocouples, 66 strain gages, and 8 bondline pressure measurements. The second nozzle had 59 thermocouples, 68 strain measurements, and 8 bondline pressure measurements. Most of this instrumentation was on the nonmetallic parts, and provided significantly more thermal and strain

data on the nonmetallic components of a nozzle than has been accumulated in a solid rocket motor test to date. Author

N86-20461# Committee on Science and Technology (U. S. House).
CENTAUR COST, SCHEDULE AND PERFORMANCE REVIEW
Washington GPO 1985 86 p Hearings before the Comm. on Sci. and Technol., 99th Congr., 1st Sess., No. 34, 21 and 23 May 1985
(GPO-51-382) Avail: Subcommittee on Space Science and Applications

The Subcommittee on Space Science and Applications of the Committee on Science and Technology of the U.S. House of Representatives (99th Congress) met on 21-23 May 1985 to perform a cost, schedule and performance review of the Space Shuttle/Centaur Program. Excessive costs, amounting to more than 100 million dollars were attributed by the Subcommittee to government indecision, contracting delays, launch schedule pressures, and breakdowns in engineering and management systems at NASA and the contractor. The Centaur G-Prime vehicles were to be available for the Galileo Mission to Jupiter and the International Solar Polar Mission, but scheduled for launch in May - June 1986. However, this schedule cannot be met, and the next Jupiter launch window is not until July 1987. F.M.R.

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N86-20462# Committee on Science and Technology (U. S. House).
RESULTS OF SPACE SHUTTLE FLIGHT 51-D
Washington GPO 1985 29 p Hearing before the Subcommittee on Space Science and Applications of the Committee on Science and Technology, 99th Congress, 1st Session, no 19, 3 May 1985
(GPO-48-813) Avail: Subcommittee on Space Science and Applications

Col. Karol Bobko, mission commander of Space Shuttle Discovery Flight 51-D, reported on that mission before the Subcommittee on Space Science and Applications of the Committee on Space and Technology of the House of Representative (99th Congress) on 3 May 1985. The flight program consisted of the launch of two satellites, operation of the continuous-flow electrophoresis experiment, investigations using an echocardiograph, student experiments, as well as planned observations of the Earth. One of the satellites, a Syncom, failed to activate. Otherwise the flight was nominal. F.M.R.

N86-20463# Committee on Science and Technology (U. S. House).
RESULTS OF SPACE SHUTTLE FLIGHT 51-D
Washington GPO 1985 29 p Hearing before the Subcommittee on Space Science and Applications of the Committee on Science and Technology, 99th Congress, 1st Session, no. 19, 3 May 1985
(GPO-58-813) Avail: Subcommittee on Space Science and Applications

The Congressional Subcommittee on Space Science and applications held hearings on the results of the Space Shuttle flight 51-d activities onboard the Space Shuttle Discovery included: deployment of two (Anik and Syncom) satellites, continued operation of the continuous flow electrophoresis experiment, echocardiograph investigations, student experiments, gas canisters. Earth observations and an unexpected space rendezvous with an artificial satellite and the use of the mechanical arm. E.A.K.

N86-20464# Congressional Budget Office, Washington, D. C.
BUDGET EFFECTS OF THE CHALLENGER ACCIDENT
David H. Moore and Patricia H. Johnston, ed. Mar. 1986 23 p
Avail: NTIS HC A02/MF A01

The preliminary estimates of the effects of the Challenger accident on the NASA budget for FY 1986 and 1987 are presented. E.A.K.

N86-20465# Air Force Academy, Colo.
STS (SPACE TRANSPORTATION SYSTEM) TASK SIMULATOR Final Report, Aug. 1984 - Aug. 1985
Salvatore Alfano 15 Aug. 1985 136 p
(AD-A162461; USAFA-TR-85-12) Avail: NTIS HC A07/MF A01 CSCL 09/2

This paper describes simplified mathematical models of the Space Transportation System (STS), Reaction Control Systems (RCS), and Digital Autopilot (DAP), used in the USAFA Proximity Operations Simulator for the VAX 11/780 and the Evans and Sutherland PS 300 computers. Included in the modeling are propellant expenditures for translational maneuvers, rotational maneuvers, and attitude maintenance and on-orbit trajectory deviations induced by RCS cross coupling. This simulator serves as a learning aid for cadets studying orbital dynamics and STS mission planning and as a research platform for the Department of Astronautics. GRA

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N86-20466*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
METHOD AND APPARATUS FOR TELEMETRY ADAPTIVE BANDWIDTH COMPRESSION Patent Application
Olin L. Graham, inventor (to NASA) Filed 13 Sep. 1985 25 p
(NASA-Case-MSC-20821-1; NAS 1.71:MSC-20821-1; US-Patent-Appl-SN-775990) Avail: NTIS HC A02/MF A01 CSCL 09F

Methods and apparatus are provided for automatic and/or manual adaptive bandwidth compression of telemetry. An adaptive sampler samples a video signal from a scanning sensor and generates a sequence of sampled fields. Each field and range rate information from the sensor are hence sequentially transmitted to and stored in a multiple adaptive field storage means. The field storage means then, in response to an automatic or manual control signal, transfers the stored sampled field signals to a video monitor in a form for sequential or simultaneous display of a desired number of stored field signals. The sampling ratio of the adaptive sampler, the relative proportion of available communication bandwidth allocated respectively to transmitted data and video information, and the number of fields are manually or automatically selectively adjustable in functional relation to each other and detected range rate. In one embodiment, when relatively little or no scene motion is detected, the control signal maximizes sampling ratio and cause simultaneous display of all stored fields, thus maximizing display resolution and bandwidth available or data transmission. When increased scene motion is detected, the control signal is adjusted accordingly to cause display of fewer fields. If greater resolution is desired, the control signal is adjusted to increase sampling ratio. NASA

N86-20467# Technische Hogeschool, Delft (Netherlands). Dept. of Maritime Engineering.
NAVIGATION BY SATELLITE TIMING AND RANGING: GLOBAL POSITIONING SYSTEM (GPS) NAVSTAR
J. A. Spaans Mar. 1984 59 p refs
Avail: NTIS HC A04/MF A01

The NAVSTAR satellite positioning system is described. The control, user, and space vehicle segments are outlined. Signal processing; signal decoding; the data blocks of the navigation message; the positioning equations; position accuracy; velocity measurement; the navigation filter; and high accuracy applications of the system are discussed. Author (ESA)

N86-20468# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
NAVSAT SYSTEM SIMULATOR Final Report
G. J. Dekker, L. J. M. Joonsten, P. J. dePagter, and W. J. Pol Paris ESA 23 Jan. 1985 68 p refs
(Contract ESA-5649/83-D-JS(SC))
(NLR-TR-85022-L; ESA-CR(P)-2152) Avail: NTIS HC A04/MF A01

The initial set of models to be used to demonstrate the correct working of the NAVSAT-system simulator is described. The set comprises the course of the navigation signal from the Regional Center to the user. It contains sufficient elements to demonstrate the hierarchical structure of the modeling process. Most models use empirical error functions. The most complex one calculates the errors to be added to the miminal satellite positions. The user-models have a complete algorithm to estimate position. The output of the simulation is the error in the estimated position and velocity of the user. Author (ESA)

N86-20456# Joint Publications Research Service, Arlington, Va.
HISTORICAL OVERVIEW OF INTERCOSMOS PROGRAM
M. A. Rimsha *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 79-86 refs Transl. into ENGLISH from Zemlya I Vselennaya (Moscow, USSR), no. 6, Nov. - Dec. 1984 p 26-32
(For primary document see N86-20437 11-12)
Avail: NTIS HC A05

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N86-20469* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACE PROBE/SATELLITE EJECTION APPARATUS FOR SPACECRAFT Patent
Harold M. Smyly, Charles D. Miller, Richard A. Cloyd, and Clarence Heller, inventors(to NASA) Issued 26 Nov. 1985 13 p Filed 5 Apr. 1984
(NASA-Case-MFS-25429-1; US-Patent-4,554,905;
US-Patent-Appl-SN-596959; US-Patent-Class-124-56;
US-Patent-Class-244-158-R; US-Patent-Class-403-328) Avail: US Patent and Trademark Office CSCL 22B

An ejection apparatus for spinning and propelling objects for ejection from a spacecraft at a desired velocity and rotational speed is discussed. The apparatus includes a launch cradle on which the space object to be ejected rests. The cradle is rotatably supported by a central hub secured to the upper end of the pneumatic cylinder piston shaft. Release mechanisms consisting of a retractable pin and locking lug is utilized to hold the cradle and object to be ejected. The release mechanism has a fixed barrier member which holds the retractable pin in engagement with the locking lug until release by upward movement of the launch cradle beyond the barrier height.
Official Gazette of the U.S. Patent and Trademark Office

N86-20470*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
TELESCOPING SPACE STATION MODULES Patent Application
Robert D. Witcofski, inventor (to NASA) Filed 31 Jul. 1985 15 p
(NASA-Case-LAR-13330-1; NAS 1.71:LAR-13330-1;
US-Patent-Appl-SN-761233) Avail: NTIS HC A02/MF A01 CSCL 22B

A space station module consisting of a cylindrical can within a can is presented. The outer can, which has one open end, encloses the inner can. The inner can has one tapered end with a hatch and one untapered end with a hatch. The outer can has one tapered end with a hatch. The overall length of the outer can is 25 ft, and its outer diameter is 14 ft. Two such assemblies easily fit end to end in the Shuttle Orbiter payload bay. With a shuttle payload capability of 65,000 pounds and an approximate weight of each twin can assembly of 16,000 pounds, 33,000 pounds of payload are available for instrumenting the cans. Only the inner can can be instrumented prior to launch. Once in orbit, the module is expanded to provide twice the usable space, approximately 48 ft total length. NASA

N86-20471*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
AEROBRAKING ORBITAL TRANSFER VEHICLE Patent Application
Carl D. Scott, Kornel Nagy, Barney B. Roberts, Robert C. Ried, Kenneth R. Kroll, and Joe D. Gamble, inventors (to NASA) Filed 18 Jun. 1985 15 p
(NASA-Case-MSC-20921-1; NAS 1.71:MSC-20921-1;
US-Patent-Appl-SN-746162) Avail: NTIS HC A02/MF A01 CSCL 22B

An aerobraking orbital transfer vehicle is described. The vehicle includes an aerobraking device which also serves as a heat shield in the shape of a raked-off elliptic or circular cone with a circular or elliptical base, and with an ellipsoid or other blunt shape nose. The aerobraking device is fitted with a toroid-like skirt and is integral with the support structure of the propulsion system and other systems of the space vehicle. The vehicle is intended to be transported in components to a space station in low Earth orbit where it is assembled for use as a transportation system from low Earth orbit to geosynchronous Earth orbit and return. Conventional guidance means are included for autonomous flight. NASA

N86-20472*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
SPACE STATION DATA SYSTEM ANALYSIS/ARCHITECTURE STUDY. TASK 2: OPTIONS DEVELOPMENT DR-5. VOLUME 1: TECHNOLOGY OPTIONS
May 1985 379 p refs Prepared in cooperation with Ford Aerospace Communications Corp., Sunnyvale, Calif., IBM Federal Systems Div., Cape Canaveral, Fla. and Radio Corporation of America, Hollywood, Calif.
(Contract NAS5-28082)
(NASA-CR-177839; NAS 1.26:177839; MDC-H1343A) Avail: NTIS HC A17/MF A01 CSCL 22B

The second task in the Space Station Data System (SSDS) Analysis/Architecture Study is the development of an information base that will support the conduct of trade studies and provide sufficient data to make key design/programmatic decisions. This volume identifies the preferred options in the technology category and characterizes these options with respect to performance attributes, constraints, cost, and risk. The technology category includes advanced materials, processes, and techniques that can be used to enhance the implementation of SSDS design structures. The specific areas discussed are mass storage, including space and round on-line storage and off-line storage; man/machine interface; data processing hardware, including flight computers and advanced/fault tolerant computer architectures; and software, including data compression algorithms, on-board high level languages, and software tools. Also discussed are artificial intelligence applications and hard-wire communications. M.G.

N86-20473*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
SPACE STATION DATA SYSTEM ANALYSIS/ARCHITECTURE STUDY. TASK 1: FUNCTIONAL REQUIREMENTS DEFINITION, DR-5
Dec. 1985 308 p refs
(Contract NAS5-28082)
(NASA-CR-177838; NAS 1.26:177838; MDC-H1343A-Rev) Avail: NTIS HC A14/MF A01 CSCL 22B

The initial task in the Space Station Data System (SSDS)

Analysis/Architecture Study is the definition of the functional and key performance requirements for the SSDS. The SSDS is the set of hardware and software, both on the ground and in space, that provides the basic data management services for Space Station customers and systems. The primary purpose of the requirements development activity was to provide a coordinated, documented requirements set as a basis for the system definition of the SSDS and for other subsequent study activities. These requirements should also prove useful to other Space Station activities in that they provide an indication of the scope of the information services and systems that will be needed in the Space Station program. The major results of the requirements development task are as follows: (1) identification of a conceptual topology and architecture for the end-to-end Space Station Information Systems (SSIS); (2) development of a complete set of functional requirements and design drivers for the SSIS; (3) development of functional requirements and key performance requirements for the Space Station Data System (SSDS); and (4) definition of an operating concept for the SSIS. The operating concept was developed both from a Space Station payload customer and operator perspective in order to allow a requirements practicality assessment. M.G.

N86-20474*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
SPACE STATION DATA SYSTEM ANALYSIS/ARCHITECTURE STUDY. TASK 3: TRADE STUDIES, DR-5, VOLUME 1
Dec. 1985 383 p refs 7 Vol.
(Contract NAS5-28082)
(NASA-CR-177842; NAS 1.26:177842; MDC-H1343A-Vol-1) Avail: NTIS HC A17/MF A01 CSCL 22B

The primary objective of Task 3 is to provide additional analysis and insight necessary to support key design/programmatic decision for options quantification and selection for system definition. This includes: (1) the identification of key trade study topics; (2) the definition of a trade study procedure for each topic (issues to be resolved, key inputs, criteria/weighting, methodology); (3) conduct tradeoff and sensitivity analysis; and (4) the review/verification of results within the context of evolving system design and definition. The trade study topics addressed in this volume include space autonomy and function automation, software transportability, system network topology, communications standardization, onboard local area networking, distributed operating system, software configuration management, and the software development environment facility. M.G.

N86-20475*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
SPACE STATION DATA SYSTEM ANALYSIS/ARCHITECTURE STUDY. TASK 2: OPTIONS DEVELOPMENT, DR-5. VOLUME 2: DESIGN OPTIONS
Dec. 1985 435 p 7 Vol.
(Contract NAS5-28082)
(NASA-CR-177840; NAS 1.26:177840; MDC-H1341A-Vol-2) Avail: NTIS HC A19/MF A01 CSCL 22B

The primary objective of Task 2 is the development of an information base that will support the conduct of trade studies and provide sufficient data to make key design/programmatic decisions. This includes: (1) the establishment of option categories that are most likely to influence Space Station Data System (SSDS) definition; (2) the identification of preferred options in each category; and (3) the characterization of these options with respect to performance attributes, constraints, cost and risk. This volume contains the options development for the design category. This category comprises alternative structures, configurations and techniques that can be used to develop designs that are responsive to the SSDS requirements. The specific areas discussed are software, including data base management and distributed operating systems; system architecture, including fault tolerance and system growth/automation/autonomy and system interfaces; time management; and system security/privacy. Also discussed are space communications and local area networking. M.G.

N86-20476*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
SPACE STATION DATA SYSTEM ANALYSIS/ARCHITECTURE STUDY. TASK 3: TRADE STUDIES, DR-5, VOLUME 2
Dec. 1985 298 p refs 7 Vol.
(Contract NAS5-28082)
(NASA-CR-177843; NAS 1.26:177843; MDC-H1343A-Vol-2) Avail: NTIS HC A13/MF A01 CSCL 22B

Results of a Space Station Data System Analysis/Architecture Study for the Goddard Space Flight Center are presented. This study, which emphasized a system engineering design for a complete, end-to-end data system, was divided into six tasks: (1); Functional requirements definition; (2) Options development; (3) Trade studies; (4) System definitions; (5) Program plan; and (6) Study maintenance. The Task inter-relationship and documentation flow are described. Information in volume 2 is devoted to Task 3: trade Studies. Trade Studies have been carried out in the following areas: (1) software development test and integration capability; (2) fault tolerant computing; (3) space qualified computers; (4) distributed data base management system; (5) system integration test and verification; (6) crew workstations; (7) mass storage; (8) command and resource management; and (9) space communications. Results are presented for each task. B.W.

N86-20477*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
SPACE STATION DATA SYSTEM ANALYSIS/ARCHITECTURE STUDY. TASK 2: OPTIONS DEVELOPMENT, DR-5. VOLUME 3: PROGRAMMATIC OPTIONS
Dec. 1985 240 p refs 7 Vol.
(Contract NAS5-28082)
(NASA-CR-177841; NAS 1.26:177841; MDC-H1343A-Vol-3) Avail: NTIS HC A11/MF A01 CSCL 22B

Task 2 in the Space Station Data System (SSDS) Analysis/Architecture Study is the development of an information base that will support the conduct of trade studies and provide sufficient data to make design/programmatic decisions. This volume identifies the preferred options in the programmatic category and characterizes these options with respect to performance attributes, constraints, costs, and risks. The programmatic category includes methods used to administrate/manage the development, operation and maintenance of the SSDS. The specific areas discussed include standardization/commonality; systems management; and systems development, including hardware procurement, software development and system integration, test and verification. M.G.

N86-20478*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
SPACE STATION DATA SYSTEM ANALYSIS/ARCHITECTURE STUDY. TASK 1: FUNCTIONAL REQUIREMENTS DEFINITION, DR-5. APPENDIX: REQUIREMENTS DATA BASE
Dec. 1985 559 p 7 Vol.
(Contract NAS5-28082)
(NASA-CR-177847; NAS 1.26:177847; MDC-H1343A) Avail: NTIS HC A25/MF A01 CSCL 22B

Appendix A contains data that characterize the system functions in sufficient depth as to determine the requirements for the Space Station Data System (SSDS). This data is in the form of: (1) top down traceability report; (2) bottom up traceability report; (3) requirements data sheets; and (4) cross index of requirements paragraphs of the source documents and the requirements numbers. A data base users guide is included that interested parties can use to access the requirements data base and get up to date information about the functions. M.G.

N86-20479*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
SPACE STATION DATA SYSTEM ANALYSIS/ARCHITECTURE STUDY. TASK 4: SYSTEM DEFINITION REPORT
Dec. 1985 574 p refs 7 Vol.
(Contract NAS5-28082)
(NASA-CR-177844; NAS 1.26:177844; MDC-H1343A) Avail: NTIS HC A25/MF A01 CSCL 22B

Functional/performance requirements for the Space Station Data System (SSDS) are analyzed and architectural design concepts are derived and evaluated in terms of their performance and growth potential, technical feasibility and risk, and cost effectiveness. The design concepts discussed are grouped under five major areas: SSDS top-level architecture overview, end-to-end SSDS design and operations perspective, communications assumptions and traffic analysis, onboard SSDS definition, and ground SSDS definition. M.G.

N86-20480*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
SPACE STATION DATA SYSTEM ANALYSIS/ARCHITECTURE STUDY. TASK 4: SYSTEM DEFINITION REPORT. APPENDIX
Dec. 1985 610 p 7 Vol.
(Contract NAS5-28082)
(NASA-CR-177845; NAS 1.26:177845; MDC-H1343A) Avail: NTIS HC A99/MF A01 CSCL 22B

Appendices to the systems definition study for the space station Data System are compiled. Supplemental information on external interface specification, simulation and modeling, and function design characteristics is presented along with data flow diagrams, a data dictionary, and function allocation matrices. M.G.

N86-20481*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
SPACE STATION DATA SYSTEM ANALYSIS/ARCHITECTURE STUDY. TASK 5: PROGRAM PLAN
Dec. 1985 135 p
(Contract NAS5-28082)
(NASA-CR-177846; NAS 1.26:177846; MDC-H1343A) Avail: NTIS HC A07/MF A01 CSCL 22B

Cost estimates for both the on-board and ground segments of the Space Station Data System (SSDS) are presented along with summary program schedules. Advanced technology development recommendations are provided in the areas of distributed data base management, end-to-end protocols, command/resource management, and flight qualified artificial intelligence machines. M.G.

N86-20482*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CONSTRUCTION AND CONTROL OF LARGE SPACE STRUCTURES
Michael F. Card, Walter L. Heard, Jr., and David L. Akin (MIT, Cambridge) Feb. 1986 21 p refs
(NASA-TM-87689; NAS 1.15:87689) Avail: NTIS HC A02/MF A01 CSCL 22B

Recent NASA research efforts on space construction are reviewed. Preliminary results of the EASE/ACCESS Shuttle experiments are discussed. A 45-foot beam was constructed on orbit in 30 minutes using a manual assembly technique at a work station. A large tetrahedron was constructed several times using a free floating technique. The capability of repair, utilities installation, and handling the structures using a mobile foot restraint on the RMS was also demonstrated. Implications of the experiments for space station are presented. Models of 5-meter space station structure together with neutral buoyancy simulations suggest manual assembly techniques are feasible. Selected research on control of flexible structures is discussed. Author

N86-20483# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ELECTROSTATIC POTENTIAL AND DENSITY ESTIMATION AROUND A IONOSPHERIC SATELLITE
Isabel Maria deMoraes, Nellore Srinivasan Venkataraman, and Hans-Ulrich Pilchowski Jan. 1986 25 p refs Submitted for publication
(INPE-3742-PRE/873) Avail: NTIS HC A02/MF A01

This work presents the electrostatic potential distribution around a spherical ionospheric satellite by solving Poisson's equation through a finite difference method. The approximate numerical densities for ions and electrons are obtained as one solves the Boltzmann's equation by means of the characteristics method. It is shown that the use of a local planar approximation for the numerical electron density gives reasonably accurate results compared with the radial approximation, which has been used in former works. Author

N86-20484# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A REVIEW OF THE PERTURBATION TECHNIQUES FOR THE SOLUTION OF THE MOTION OF ARTIFICIAL SATELLITES
Kondapalli Rama Rao Jan. 1986 6 p refs Presented at TELECON 85, Rio de Janeiro, Brazil, 10-13 Dec. 1985
(INPE-3751-PRE/875) Avail: NTIS HC A02/MF A01

To generate satellite ephemerides, an orbit determination system uses, in general, one of the three fundamental perturbation methods, namely: the analytical methods, the numerical methods and the semianalytical methods. The aim of this work is to review the orbital theory, involving these methods, developed during the last 25 years and analyze the limits of application of these techniques in the case of the artificial low-orbit Earth satellites. Author

N86-20485*# Columbia Univ., New York. Dept. of Civil Engineering and Engineering Mechanics.
VIBRATIONS AND STRUCTUREBORNE NOISE IN SPACE STATION Progress Report, 1 Jul. - 31 Dec. 1985
Rimas Vaicaitis 31 Dec. 1985 119 p refs
(Grant NAG1-541)
(NASA-CR-176520; NAS 1.26:176520) Avail: NTIS HC A06/MF A01 CSCL 22B

Theoretical models were developed capable of predicting structural response and noise transmission to random point mechanical loads. Fiber reinforced composite and aluminum materials were considered. Cylindrical shells and circular plates were taken as typical representatives of structural components for space station habitability modules. Analytical formulations include double wall and single wall constructions. Pressurized and unpressurized models were considered. Parametric studies were conducted to determine the effect on structural response and noise transmission due to fiber orientation, point load location, damping in the core and the main load carrying structure, pressurization, interior acoustic absorption, etc. These analytical models could serve as preliminary tools for assessing noise related problems, for space station applications. Author

N86-20486# Harris Corp., Melbourne, Fla. Government Aerospace Systems Div.
EXPLORATION OF THE MAXIMUM ENTROPY/OPTIMAL PROJECTION APPROACH TO CONTROL DESIGN SYNTHESIS FOR LARGE SPACE STRUCTURES Annual Report, 2 Jan. 1984 - 28 Feb. 1985
David C. Hyland and Dennis S. Bernstein Feb. 1985 243 p
(Contract F49620-84-C-0015)
(AD-A161355; AFOSR-85-0966TR; AR-1) Avail: NTIS HC A11/MF A01 CSCL 13/13

Increased interest in deploying large flexible spacecraft has focused attention on active structural control techniques to achieve crucial advances in vibration suppression, pointing accuracy and shape control. The extreme complexity of such systems, and the lack of accurate finite-element structural models present severe control-design challenges which were extensively documented by previous Government research Programs. Optimal Projection/Maximum Entropy Stochastic Modelling and Reduced-Order Design Synthesis is a rigorous new approach to this class of problems. Inspired by Statistical Energy Analysis, a branch of dynamic modal analysis developed for analyzing acoustic vibration problems, its present stage of development embodies a fundamental generalization of classical steady-state Kalman filter and linear-quadratic-Gaussian optimal control theory. GRA

N86-20487# ALPHATECH, Inc., Burlington, Mass.
ROBUST DECENTRALIZED CONTROL Final Report, 20 Jul. 1984 - 20 May 1985

Douglas P. Looze, George C. Goodman, John S. Eterno, and Michael Athans Aug. 1985 155 p
(Contract F33615-84-C-3618)
(AD-A161626; AFWAL-TR-85-3042) Avail: NTIS HC A08/MF A01 CSCL 22/2

This report considers the problem of designing decentralized control systems for Large Space Structures to satisfy robustness and performance requirements for multiple system configurations. The problem is motivated by the fact that such structures will have to be assembled in space. A partially assembled structure will need some real-time control so that it maintains its station, performs partial functions, and damps oscillations during assembly. Completely reprogramming the control computers each time a subassembly is incorporated in the structure is likely to be impractical. A more sound engineering approach would be to require the same control system design to satisfy performance requirements for the partial assemblies and to maintain stability for the completely assembled structure. Performance can then be restored for the full assembly by applying an outer loop (hierarchical) control or adjusting the decentralized design parameters. GRA

N86-20488# WEA, Cambridge, Mass.
WAVE MEASUREMENTS ON TRUSS MODEL Technical Report, 1 Jan. 1984 - 1 Sep. 1985
James H. Williams, Jr., Howard L. Ou, and Samson S. Lee 1 Sep. 1985 72 p
(Contract F49620-83-C-0092)
(AD-A162433; AFOSR-85-1077TR) Avail: NTIS HC A04/MF A01 CSCL 22/2

Large space structures (LSS) are large periodic lattice structures being considered for space applications in Earth orbit. The vibration and wave propagation characteristics of these structures can affect their performance, integrity and the ability to nondestructively assess that integrity. In this preliminary study, the wave propagation characteristics of a tetrahedral truss model consisting of fiberglass reinforced composite rods and aluminum joints are observed experimentally. Longitudinal ultrasonic transducers are coupled to the joints of the truss model. The input signal consists of a gated sinusoid having a center frequency of 280 kHz. Because a tetrahedral truss, a commonly proposed LSS configuration can be constructed from basic repeating units of tetrahedrons and pyramids, only tetrahedrons and pyramids are considered. Tetrahedrons and pyramids are constructed by inserting fiberglass reinforced polyester rods 0.193 cm (0.076 in) in diameter and 18.72 cm (7.37 in) in length into machined 2024-T4 aluminum joints. Because a tetrahedral truss requires only two types of joints, the tetrahedrons and pyramids are constructed using the two types of joints. The cutting of the fiberglass rods, the machining of the aluminum joints and the final assembly of tetrahedrons and pyramids are done with great care to minimize structure variability. GRA

N86-20489# National Aerospace Lab., Amsterdam (Netherlands). Spaceflight Div.
TESTING OF SPACECRAFT ATTITUDE AND ORBIT CONTROL SYSTEMS Final Report
J. J. M. Prins Paris ESA 18 May 1984 267 p refs
(Contract ESA-5262/82)
(NLR-TR-84133-L; ESA-CR(P)-2100) Avail: NTIS HC A12/MF A01

The testing of spacecraft Attitude and Orbit Control Subsystems (AOCS) from the early design up to in-flight is described. Three generic AOCS test classes, model philosophy, standardization, subsystem static test methods, subsystem dynamic test methods, generic test equipment, and test facilities are covered. It is suggested that test scheduling should aim to find problems and errors as early as possible. System level tests should be delayed in favor of detailed testing of the AOCS (unit level) and in particular subsystem level testing. Onboard AOCS software poses testing problems, especially when RAM located. There is a shift from airbearing-type dynamic tests to servotable-type dynamic tests, mainly due to increasing spacecraft size, structural flexibility, and multibody dynamics concepts. Author (ESA)

N86-20490# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
IMPROVEMENT OF HYDRAZINE GAS GENERATOR SYSTEM FOR ATTITUDE CONTROL OF SPACECRAFT Final Report
Paris ESA Feb. 1985 84 p
(Contract ESTEC-4826/81-NL-AK)
(ESA-CR(P)-2146) Avail: NTIS HC A05/MF A01

Solid deposit formation in an electrothermal and a catalytic hydrazine decomposition gas generator was studied. A 12 month endurance life test shows that problems due to formation of solid deposits in the cold gas valve do not occur. The decomposition of hydrazine by the catalytic gas generator is complete so that no fluid condensates are found in the plenum tank. The use of purified low aniline hydrazine is the reason for trouble-free endurance life firing. A manufacturing problem observed with the gas generator middle screen is noted. The problem does not influence gas generator performance much. Modifications to increase the life of the gas generator are suggested. It is stated that a hydrazine gas generator pressure system is a good alternative to argon, nitrogen, or other cold gas systems and is able to fulfill the mission requirements for satellites, probes, and space station elements, because by application of manual override a system with flexible preselectable thrust levels is available. Author (ESA)

N86-20491# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
EVALUATION OF TECHNIQUES FOR DETERMINATION OF LOADS DUE TO FLUID-STRUCTURE INTERACTION Final Report
C. Stavrindis 15 Jun. 1985 227 p refs
(Contract ESTEC-5094/82-NL-PB)
(ESA-CR(P)-2151) Avail: NTIS HC A11/MF A01

Finite element and classical methods for determining fluid-structure interactions in spacecraft are reviewed. For evaluation of fluid sloshing eigenfrequencies and fluid-structure coupled eigenfrequencies, three finite element computer programs were used. The ANSYS program includes nearly all features which are necessary for fluid-structure interaction calculations and only a few restrictions have to be considered, whereas NASTRAN (virtual mass method, fluid ring element method) is designed only for special cases. Author (ESA)

N86-20440# Joint Publications Research Service, Arlington, Va.
PROBOS MISSION DISCUSSED AT INTERNATIONAL COMMITTEE MEETING
V. Ovcharov *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 29 Transl. into ENGLISH from Sovetskaya Moldaviya (Kishinev, USSR), 15 Nov. 1985 p 3 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

N86-21134# Joint Publications Research Service, Arlington, Va.
METHODOLOGICAL PROBLEMS RELATED TO GROUND-BASED TESTING OF TEMPERATURE-CONTROL SYSTEM FOR MANNED SPACECRAFT
L. B. Strogonova *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) 19 Feb. 1986 p 124-125 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 82-83 (For primary document see N86-21114 11-52)
Avail: NTIS HC A08/MF A01

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

N86-20492*# Essex Corp., Huntsville, Ala.
DEVELOPMENT OF SPACE TELESCOPE NON-ORU HARDWARE Final Report
Kem B. Robertson and David E. Henderson 31 Dec. 1985 37 p

(Contract NAS8-36364)
(NASA-CR-178713; NAS 1.26:178713; H-85-10) Avail: NTIS HC A03/MF A01 CSCL 03A

Since 1979 work has progressed in the development of the Hubble Space Telescope (HST) mockup. Underwater simulations to evaluate proposed on-orbit servicing tasks have also been done. These tasks involve the planned changeout of scientific instruments and the unscheduled changeout of other orbital replacement units (ORUs) such as batteries and computers. The HST components and subsystems that originally were designated ORUs were the items that were mission critical and were designed for easy changeout. Mockups of 14 non-ORU items were designed and fabricated for the purpose of evaluating the EVA changetasks in the MSFC Neutral Buoyancy Simulator (NBS). The objectives of this design/fabrication/test activity were to design and fabricate the potential ORUs so they contained realistic interfaces and were compatible with the NBS environments. The attachment of the mockup hardware to the spacecraft mockup was similar to the flight version. Also, the hardware connectors were flight-like. B.W.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N86-20493*# General Dynamics/Convair, San Diego, Calif. Advanced Space Programs.
ORBITAL TRANSFER VEHICLE ENGINE INTEGRATION STUDY Final Report
W. J. Ketchum 30 Nov. 1984 51 p refs
(Contract NAS3-23772; NASA Order L-814740)
(NASA-CR-174842; NAS 1.26:174842; GDC-SP-84-050) Avail: NTIS HC A04/MF A01 CSCL 21H

NASA-LeRC is sponsoring industry studies to establish the technology base for an advanced engine for orbital transfer vehicles for mid-1990s IOC. Engine contractors are being assisted by vehicle contractors to define the requirements, interface conditions, and operational design criteria for new LO2-LH2 propulsion systems applicable to future orbit transfer vehicles and to assess the impacts on space basing, man rating, and low-G transfer missions on propulsion system design requirements. The results of a study is presented. The primary study emphasis was to determine what the OTV engine thrust level should be, how many engines are required on the OTV, and how the OTV engine should be designed. This was accomplished by evaluating planned OTV missions and concepts to determine the requirements for the OTV propulsion system, conducting tradeoffs and comparisons to optimize OTV capability, and evaluating reliability and maintenance to determine the recommended OTV engine design for future development.
Author

N86-20494*# Lockheed Missiles and Space Co., Huntsville, Ala. Systems Analysis and Simulation Section.
SHUTTLE SRB PREFLIGHT/POST-FLIGHT THERMAL ASSESSMENT Final Report
5 Dec. 1985 9 p
(Contract NAS8-34335)
(NASA-CR-178706; NAS 1.26:178706; LMSC-HREC-TR-F042735) Avail: NTIS HC A02/MF A01 CSCL 21H

The development of the thermal protection system for the Solid Rocket Booster is reported. Tests and analytical efforts were conducted and new problems are continually attacked and solved. During the first six Shuttle flights it was necessary to make a final thermal assessment of the TPS and structural systems temperatures. The thermal assessments were made and are compared with post flight data. E.A.K.

N86-20495*# Pratt and Whitney Aircraft, West Palm Beach, Fla. Government Products Div.
ADVANCED TURBINE STUDY Final Report, 1 Aug. 1982 - 15 Aug. 1985
J. H. Castro 10 Dec. 1985 188 p
(Contract NAS8-33821)
(NASA-CR-178707; NAS 1.26:178707; FR-19009-1) Avail: NTIS HC A09/MF A01 CSCL 21H

The feasibility of an advanced convective cooling concept applied to rocket turbine airfoils which operate in a high pressure hydrogen and methane environment was investigated. The concept consists of a central structural member in which grooves are machined. The grooves are temporarily filled with a removable filler and the entire airfoil is covered with a layer of electroformed nickel, or nickel base alloy. After removal of the filler, the low thermal resistance of the nickel closure causes the wall temperature to be reduced by heat transfer to the coolant. The program is divided in the following tasks: (1) turbine performance appraisal; (2) coolant geometry evaluation; (3) test hardware design and analysis; and (4) test airfoil fabrication. E.A.K.

N86-20496*# Lockheed Missiles and Space Co., Huntsville, Ala.
SSME STRUCTURAL DYNAMIC MODEL DEVELOPMENT, PHASE 2 Final Report
M. J. Foley and V. L. Wilson 1 Nov. 1985 234 p refs
(Contract NAS8-34973)
(NASA-CR-178708; NAS 1.26:178708; LMSC-HEC-TR-F042668) Avail: NTIS HC A11/MF A01 CSCL 21H

A set of test correlated mathematical models of the SSME High Pressure Oxygen Turbopump (HPOTP) housing and rotor assembly was produced. New analysis methods within the EISI/EAL and SPAR systems were investigated and runstreams for future use were developed. The LOX pump models have undergone extensive modification since the first phase of this effort was completed. The rotor assembly from the original model was abandoned and a new, more detailed model constructed. A description of the new rotor math model is presented. Also, the pump housing model was continually modified as additional test data have become available. This model is documented along with measured test results. Many of the more advanced features of the EAL/SPAR finite element analysis system were exercised. These included the cyclic symmetry option, the macro-element procedures, and the fluid analysis capability. In addition, a new tool was developed that allows an automated analysis of a disjoint structure in terms of its component modes. A complete description of the implementation of the Craig-Bampton method is given along with two worked examples. Author

N86-20497*# Solar Turbines International, San Diego, Calif.
ROCKET THRUST CHAMBER THERMAL BARRIER COATINGS Final Report, Dec. 1981 - Oct. 1984
A. P. Batakis and J. W. Vogan Jul. 1985 169 p refs
(Contract NAS3-23262)
(NASA-CR-175022; NAS 1.26:175022; SR85-R-5052-16) Avail: NTIS HC A08/MF A01 CSCL 21H

A research program was conducted to generate data and develop analytical techniques to predict the performance and reliability of ceramic thermal barrier coatings in high heat flux environments. A finite element model was used to analyze the thermomechanical behavior of coating systems in rocket thrust chambers. Candidate coating systems (using a copper substrate, NiCrAlY bond coat and ZrO2.8Y2O3 ceramic overcoat) were selected for detailed study based on photomicrographic evaluations of experimental test specimens. The effects of plasma spray application parameters on the material properties of these coatings were measured and the effects on coating performance evaluated using the finite element model. Coating design curves which define acceptable operating envelopes for seleted coating systems were constructed based on temperature and strain limitations. Spray gun power levels was found to have the most significant effect on coating structure. Three coating systems were selected for study using different power levels. Thermal conductivity, strain tolerance, density, and residual stress were measured for these

coatings. Analyses indicated that extremely thin coatings (< 0.02 mm) are required to accommodate the high heat flux of a rocket thrust chamber and ensure structural integrity. Author

N86-20498# Naval Plant Representative, Magma, Utah.
DESIGN OF COMPOSITE MATERIAL CHAMBERS FOR SOLID PROPELLANT MISSILE MOTORS
J. L. Szatkowski Aug. 1985 25 p refs
(AD-A158890) Avail: NTIS HC A02/MF A01 CSCL 11/4

A review of the technical research on composite materials used in the manufacture of solid propellant missiles was conducted. Current design methods were compared to the methods given in the literature. Most of the designers of composite structures use empirical relationships based on data compiled from previous designs, to predict the structure's characteristics. No universal approach to characterization of material properties of composites has been found, because no one has been able to adequately characterize the material properties of the constituent materials and their interrelationships. Recent analyses have shown that only finite element analysis (FEA) can adequately represent the material loading within the composite matrix. Accurate material properties, obtained only by detailed analysis of experimental work, are required to be used in the calculations. The properties are deduced from the experimental results by computer analysis by finite elements. Accurate analysis of the total structure of a composite material chamber will also require the use of 3-dimensional FEA. The use of 3-D FE has been limited because of computer time and costs. However, new computers will now handle reasonable 3-dimensional problems within acceptable limits of time and cost. GRA

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N86-20499*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE 1-[(DIORGANOOXPHOSPHONYL)METHYL]-2, 4- AND -2, 6-DINITRO AND DIAMINO BENZENES AND THEIR DERIVATIVES Patent Application
John A. Mikroyannidis and Demetrius A. Kourtides, inventors (to NASA) Filed 16 Aug. 1984 19 p
(NASA-Case-ARC-11425-2; NAS 1.71:ARC-11425-2; US-Patent-Appl-SN-641152) Avail: NTIS HC A02/MF A01 CSCL 07C

The 1-[Diorganooxyphosphonyl]methyl] -2,4- and -2,6-dinitro- and diamino benzenes are prepared by nitrating an (organophosphonyl)methyl benezene to produce the dinitro compounds which are then reduced to the diamino compounds. The organo groups (alkyl, haloalkyl, aryl) on the phosphorus may be removed to give the free acids (HO)2P(=O)-. The diamino compounds may be polymerized with dianhydrides or diacyl halides to produce fire and flame resistant polymers which are useful in the manufacture of aircraft structures. NASA

N86-20500# Duke Univ., Durham, N. C.
GENERATION OF PHOSPHORUS ESTER, PHOSPHORUS AMIDE AND PHOSPINE DERIVATIVES OF LOW COORDINATION NUMBER Final Report, 19 Jul. 1982 - 18 Jul. 1985
Louis D. Quin 10 Oct. 1985 22 p
(Contract DAAG29-82-K-0159)
(AD-A161628; ARO-19288.10-CH) Avail: NTIS HC A02/MF A01 CSCL 07/3

The 5,6-oxaphosphabicyclo(2.2.2)octene ring system was created by O-insertion into a strained C-P bond of 7-phosphanorbornene derivatives, and then used for the generation of metaphosphoric and metaphosphonic acid derivatives by retrocyclo-addition. Synthetic methods were developed for creating 2-phosphabicyclo(2.2.2)-octene derivatives as potential generators of phosphaalkenes. The new fragments Me2N-P double bond S and Cl3CH2OP double bond S were generated from retrocycloaddition of 7-phosphanorbornene derivatives. GRA

N86-20501# California Univ., Santa Barbara. Dept. of Chemistry.
ENERGY TRANSFORMATIONS IN ORGANOMETALLIC COMPLEXES Progress Report, 1 Jul. 1984 - 31 Sep. 1985
R. J. Watts 1985 16 p
(Contract DE-AT03-78ER-70277)
(DE86-000333; DOE/ER-70277/T2) Avail: NTIS HC A02/MF A01

The primary purpose of research projects performed during this report period was to characterize the fundamental photoproperties of a variety of ortho-metalated species. The proposal which was submitted and approved in 1984 describes the initial work on dichloro-bridged dimeric complexes of Ir(III) and Rh(III) with 2-phenylpyridine (ppy) and benzoquinoline (bzq). During 1985 efforts have been expanded to incorporate the additional metal centers, Re(1) and Pd(II), as well as different ortho-metalating ligands including 3-methyl-2-phenylpyridine (mppy), 2-(p-tolylpyridine) (tpy), azobenzene (azb) and 2-phenylpyrimidine (ppyr). In addition, several new, mononuclear complexes of Ir(III) and Rh(III) with various combinations of metallated ppy or bzq and coordinated 2,2'-bipyridine (bpy) or 1,10-phenanthroline (phen) ligands have been prepared and studied. The goals of studies of these complexes are to provide a basis for evaluating their potential application as photocatalysts and to generally provide initial characterizations of the effects of metal-carbon sigma bonds on the identity, photophysics, and photochemistry of their low energy excited states. DOE

N86-20502# Los Alamos National Lab., N. Mex.
SYNTHESIS OF (13)C-ENRICHED CARBOHYDRATES AS CHIRAL SYNTHONS FOR LABELED COMPOUNDS
T. E. Walker, C. J. Unkefer, and D. S. Ehler 1985 3 p refs Presented at the 2nd International Symposium on the Synthesis and Application of Isotopically Labeled Compounds, Kansas City, Mo., 3 Sep. 1985
(Contract W-7405-eng-36)
(DE86-000780; LA-UR-85-3180; CONF-8509173-2) Avail: NTIS HC A02/MF A01

Methods have been developed to synthesize labeled chiral compounds from labeled carbohydrates. During the course of these investigations, both chemical and enzymatic methods for the large-scale interconversion of labeled aldoses and ketoses have been adapted. DOE

N86-20503# Brookhaven National Lab., Upton, N. Y.
SOME PROBLEMS WITH THE 1983 REPORTS ON ATOMIC WEIGHTS AND ISOTOPIC COMPOSITION
N. E. Holden 1985 5 p Presented at the 33rd IUPAC General Assembly, Lyon, France, 30 Aug. 1985
(Contract DE-AC02-76CH-00016)
(DE86-001167; BNL-NCS-36954; CONF-8508138-10) Avail: NTIS HC A02/MF A01

Three reports from the Commission published subsequent to the 1983 meeting in Lyngby, Denmark is discussed. Some of these comments are in the form of errata to the various reports, while others deal with inconsistencies or perhaps better methods for handling recurring items for future reports. It concludes with some thoughts for consideration by the Commission. It is hoped that discussion of these points will strengthen the Commission's efforts, while easing the burden of the Commission officers when preparing future reports for publication. DOE

N86-20504# Department of Energy, Washington, D. C. Chemical Sciences Div.
SUMMARIES OF FY 1985 RESEARCH IN THE CHEMICAL SCIENCES
Sep. 1985 116 p
(DE85-008925; DOE/ER-0144/3) Avail: NTIS HC A06/MF A01

Four hundred eleven projects supported by both the Chemical Sciences budget and that portion of the Nuclear Sciences budget

which is administered by the Division of Chemical Sciences are listed. These computer generated summaries provide the scientific and technical public and interested persons in the legislative and executive branches of the Government a means for becoming acquainted with the Chemical Sciences program. Areas of research supported by the Division are: photochemical and radiation sciences; chemical physics; atomic physics; chemical energy conversions; separations and analysis; chemical engineering basics including thermodynamics and physical and chemical rate processes; isotope preparations; heavy element chemistry of the actinides, and support for operation of the Stanford Synchrotron Radiation Laboratory. Special facilities are described whose support allows the general scientific community access to unique and/or expensive equipment for research activities where no commercial laboratory exists. Individual contacts are provided. Indexes cover researchers and facilities. DOE

N86-20505# Pittsburgh Univ., Pa. Dept. of Chemical and Petroleum Engineering.
PROMOTION EFFECTS ON THE SYNTHESIS OF HIGHER ALCOHOLS Final Report
J. G. Goodwin, Jr. and S. C. Chuang 30 Aug. 1985 243 p refs (Contract DE-FG22-82PC-50810)
(DE85-018269; DOE/PC-50810/T11) Avail: NTIS HC A11/MF A01

The importance of direct syntheses of higher (C2-C6) alcohols from synthesis gas as a promising route for providing clean fuels and petrochemical feedstocks is generally recognized. Addition of alkali salts to methanol synthesis catalysts increases production of higher alcohols. However, few investigations were made into the effect of various alkali species on the synthesis of oxygenates from CO and hydrogen. Research studies were carried out which greatly expand current knowledge Objectives were to investigate reaction pathways for and the effect of alkali promotion (Li(+), K(+), Rb(+), Cs(+)) on formation of oxygenated compounds from synthesis gas. A series of Group VIII metals (Ni, Ru, Rh, and Pd) and alkali-promoted Rh and Pd catalysts were studied using CO hydrogenation and a chemical probing method with ethylene, ethanol, and acetaldehyde as probe molecules. The chemical probing method developed for was demonstrated to be an effective way to: identify possible reaction network occurring on these catalysts; study interrelationships between oxygenate and hydrocarbon synthesis; determine catalytic properties of the catalyst surfaces; and investigate support and alkali promotion effects on reaction pathways to oxygenates and hydrocarbons. DOE

24 COMPOSITE MATERIALS

Includes laminates.

N86-20506 Department of the Air Force, Washington, D.C.
FIBER REINFORCED CARBON/CARBON COMPOSITE STRUCTURE WITH TAILORED DIRECTIONAL SHEAR STRENGTH PROPERTIES Patent
Thomas Vasilos, inventor (to Air Force) Issued 8 Oct. 1985 5 p (AD-D011953; US-Patent-4,546,032; US-Patent-Appl-SN-562369; US-Patent-Class-428-223) Avail: US Patent and Trademark Office CSCL 11/4

Fiber reinforced composite with five directions of fiber orientation comprising multiple planar fabric layers adjacent to each other with warp and fill fibers of one or more of such groups offset relative to the fibers of the others, a lateral array (extending perpendicular to the planes) of piercing fibers utilizing carbon/carbon, as reinforcement and matrix materials, providing a composite with tailored shear strength and stiffness in a selected anisotropy to meet the needs of specific thermostructural applications. GRA

N86-20507# Massachusetts Inst. of Tech., Cambridge. School of Engineering.
IMPACT RESISTANCE OF RUBBER MODIFIED CARBON FIBER COMPOSITE
J. Kawamoto, F. J. McGarry, and J. F. Mandell Feb. 1985 75 p Sponsored by Dow Chemical Co.
(PPST-85-5) Avail: NTIS HC A04/MF A01

The effect on impact resistance of inserting tailored rubbery coatings between the fibers and matrix of carbon fiber reinforced plastics was measured. A machine was designed to apply a dilute solution of varied imposition onto the carbon fibers in the form of a thin rubbery coating. For good adhesion between fibers and coatings, dilute epoxy solution was applied as a sizing in some composites. To compare bonding levels, interlaminar shear strength was measured using short beam testing. The composites were impacted by a projectile at various energy levels using a Gardner Impact Tester. Damage zones were examined under an optical microscope. The energy level to start delamination and the size and number of delaminations were studied. The morphology of the intralaminar cracks was also carefully examined. The treated materials showed a marked increase in impact resistance: two to three times as much energy was required to produce initial delamination. At high energies, cracking was more ductile with fewer cracks appearing. Author

N86-20508*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
STRENGTH OF GRAPHITE/EPOXY BOLTED WING-SKIN SPLICE SPECIMENS SUBJECTED TO OUTDOOR EXPOSURE UNDER CONSTANT LOAD AND YEARLY FATIGUE LOADING
Gregory R. Wichorek and John H. Crews, Jr. 1986 35 p refs (NASA-TP-2542; L-16065; NAS 1.60:2542) Avail: NTIS HC A03/MF A01 CSCL 11D

The results of an experimental study to provide long-term durability data on detailed full-scale graphite/epoxy wing-skin joint designs under environmental exposure and cyclic loading associated with commercial transport aircraft are reported. The specimens consisted of a single-row bolt configuration fabricated from T300/5208 and a double-row bolt configuration fabricated from T300/5209. The unpainted specimens were exposed to the outdoor environment under a sustained tensile load, and at yearly intervals, they were subjected to fatigue loading. Experimental results showed a slight reduction in residual tensile strength for both graphite/epoxy joints under the exposure times and fatigue loadings reported. A 7.5-percent decrease in residual strength was observed for the T300/5208 single-row joint after 5 years exposure and two lifetimes of fatigue loading. A 5.3-percent decrease in residual strength was observed for the T300/5209 double-row joint after 7 years exposure and 2.8 lifetimes of fatigue loading. The 5208 epoxy material was more susceptible to degradation by ultraviolet radiation than the 5209 epoxy material. Author

N86-20509# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
THE BOND STRENGTH OF COMPOSITE RESIN TO DENTAL CASTING ALLOYS USING AN ELECTRO-CHEMICAL TIN PLATING SYSTEM M.S. Thesis
K. S. Smith, II Jun. 1985 77 p
(AD-A160682; AFIT/CI/NR-85-119T) Avail: NTIS HC A05/MF A01 CSCL 11/6

An alternative to the metal ceramic restoration has been the resin veneer crown. The resin veneer offers the advantages of low cost, ability to make clinical repairs, lack of wear to opposing teeth, and ease of fabrication. Clinical use of the resin veneer has been limited due to problems associated with the resin including low resistance to abrasion, high water sorption, a high coefficient of thermal expansion, low proportional limit, and a low modulus of elasticity. Improvements realized in composite resin technology have prompted the introduction of a number of composite resin veneering materials for prosthodontic applications. An electrochemical tin plating technique has been suggested for bonding composite veneering resins in lieu of conventional mechanical retention. The adhesive bonding of veneering resins to castings would prove beneficial by improving esthetics and eliminating the percolation of fluids at the resin-metal interface. The purpose of this investigation was to examine the shear bond strength of a composite resin processed to gold and base metal specimens that were

treated with an electro-chemical tin plating technique. Uniform specimens were cast in a gold alloy and a base metal. Conventional retentive beads on the gold alloy and electroetching of the base metal served as controls in this investigation. GRA

N86-20510# Maryland Univ., College Park. Engineering Materials Group.
COMPOSITE STRENGTHENING Annual Report
R. J. Arsenault 1985 5 p
(Contract N00014-85-K-0007)
(AD-A162423) Avail: NTIS HC A02/MF A01 CSCL 11/4

It has been demonstrated that a strong interfacial bond is required to produce the observed strengthening in discontinuous SiC/Al composites. Dislocation generation (which is the strengthening mechanism) is dependent upon a good bond existing between the SiC and the Al matrix. Although it has been shown that the stresses developed in the matrix as a result of the differences in the coefficients of thermal expansion between SiC and Al are greatly reduced by the motion and generation of dislocations, an elastic residual stress can still remain. An investigation was undertaken and it was determined that in the discontinuous SiC/Al composites a tensile-elastic-residual stress remains in the matrix. It has been observed that as the strength of the matrix increases, e.g., due to alloying or age hardening, the percentage increase in yield or ultimate tensile strength decreases for a given volume per cent SiC/al composite. GRA

N86-20511# Aeronautical Research Inst. of Sweden, Stockholm.
USE OF RADIOGRAPHY FOR NONDESTRUCTIVE TESTING AND EVALUATION OF FIBER REINFORCED COMPOSITES
Anders F. Blom and Per A. Gradin (A.S. Veritas Research) Sep. 1985 31 p refs Submitted for publication Sponsored by Aeronautical Research Inst. of Sweden and A.S. Veritas Research
(FFA-TN-1985-53) Avail: NTIS HC A03/MF A01

Radiographic nondestructive testing is reviewed. Applications to composite materials are discussed, including measurements of volume fractions fiber-resin, measurements of fiber alignment and fiber flows, the use of opaque penetrants for studies of fiber fractures, matrix cracks and delaminations, use of stereoradiographic techniques for studies of through the thickness distribution of damage, neutron inspection of bonded structures, moisture determination using positron annihilation, and the determination of composite stresses with X-ray diffraction. Author (ESA)

N86-20512# Construcciones Aeronauticas S.A., Madrid (Spain). Investigacion Desarrollo de Tecnologia y Materiales.
DETERMINATION OF GEL TIME AND TEMPERATURE IN PREIMPREGNATED GROUP 4 CARBON FIBER MATERIALS [DETERMINACION DE TEMPERATURAS Y TIEMPOS DE GELIFICACION EN MATERIALES DE FIBRA DE CARBONO PREIMPREGNADOS GRUPO 4]
28 Oct. 1984 15 p In SPANISH
(I-94/84) Avail: NTIS HC A02/MF A01

Thermometric and thermomechanical tests were carried out in order to characterize the thermal behavior of Group 4 carbon fiber materials in autoclave hardening process conditions. The reaction energy and the gel time and temperature were determined. The polymerization proceeds in a similar way for the various tested specimens. Complete hardening is reached in 69 min in autoclave conditions. The average gel temperature is 159 to 163 C while the gel time is 55 to 57 min. Author (ESA)

N86-20513# Polytechnical Univ. of Madrid (Spain). Escuela Technica Superior de Ingenieros Telecomunicacion.
EPOXY MATRICES AND THEIR BEHAVIOR IN AGGRESSIVE ENVIRONMENTS [MATRICES EPOXIDICAS Y SU COMPORTAMIENTO EN AMBIENTES HOSTILES]
Senen Paz Abuin Gairesa May 1985 17 p refs In SPANISH
Avail: NTIS HC A02/MF A01

The combined effects of time stress and water absorption on epoxy matrix composites are studied. Bifunctional and tetrafunctional epoxy resins hardened with animated hardeners were exposed to moisture and stress at different temperatures. It is shown that water absorption is independent of the test temperature, that equilibrium is reduced more rapidly under stress, and that tetrafunctional resins have higher equilibrium values as well as higher glass transitions. Author (ESA)

N86-20608# Morton Thiokol, Marshall, Tex.
ELECTROSTATIC SENSITIVITY OF MAGNESIUM-TEFLON COMPOSITIONS
H. C. Havron *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 495-500 (For primary document see N86-20589 11-31)
(AD-P004840) Avail: NTIS HC A99/MF E03 CSCL 19/4

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N86-20514 Portland State Univ., Oreg.
STUDIES OF NUCLEATION AND HEAT TRANSFER IN LIQUID HELIUM ISOTOPES 3 AND 4 Ph.D. Thesis
David James Lezak 1985 102 p
Avail: Univ. Microfilms Order No. DA8520329

Light induced nucleation of vapor bubbles in superheated liquid helium 4, transient heat transfer in liquid helium isotopes 3 and 4, and homogeneous nucleation of vapor bubbles in superheated liquid helium 3 were studied. The transient heat transfer resulted in extremely high temperature measurements of the Kapitza thermal boundary conductance limits in helium 3 and 4, in measurements of the delay time to the onset of film boiling over a wide range of bath temperatures in helium 4, and in a determination of bubble growth rates in helium 4. The so called light effect were characterized and it was established photographically that small amounts of visible light will cause the formation of vapor bubbles at the interface of a solid and superheated liquid helium 4 and that this vapor can influence the quasi steady state heat flux vs temperature hysteresis curve. The homogeneous nucleation temperature of liquid helium 3 were measured and good agreement was found with the predicitons of the Becker-Doring-Volmer-Zel'dovich Frenkel nucleation theory. The study has applications to practical cryogenic engineering, to further understanding of basic heat transfer and nucleation theory, and to practical and theoretical environmental and resource considerations. Dissert. Abstr.

N86-20515# Los Alamos National Lab., N. Mex.
A CHEMICAL CHARACTERIZATION OF CHALLENGE AEROSOLS FOR HEPA FILTER PENETRATION TESTING Thesis - Colorado State Univ.
Steven W. Strandberg Apr. 1985 101 p refs
(Contract W-7405-eng-36)
(LA-10393-T) Avail: NTIS HC A06/MF A01

Quality assurance penetration testing of high efficiency particulate air (HEPA) filters use oil mists as challenge aerosols. Concern over the carcinogenic risk associated with the use of di-(2-ethylhexyl)phthalate (DEHP) led to the investigation of alternative materials and generation methods for these aerosols. Since several commonly used generation methods for quality assurance testing of HEPA filters utilize heating of the starting material, it was determined essential to evaluate the starting material and the resultant aerosol which might contain thermal degradation by-products. A penetrometer utilizing flash vaporization was developed as a possible alternative generation method to the Q-127 thermally generated DEHP penetrometer. Tetraethylene glycol, oleic acid, and DEPH aerosols were generated and particulate and vapor samples were collected and identified using gas chromatography/mass spectrometry techniques. Thermally

generated DEHP by-products were also sampled and identified using a Q-107 penetrometer used in the testing of large HEPA filters were found in the flash vaporization penetrometer, although a number of thermally generated by-products were found in the Q-107 penetrometer. Author

N86-20516# National Bureau of Standards, Washington, D.C. Center for Fire Research.
A LITERATURE REVIEW OF THE CHEMICAL NATURE AND TOXICITY OF THE DECOMPOSITION PRODUCTS OF POLYETHYLENES
Maya Paabo and Barbara C. Levin Jan. 1986 65 p refs Sponsored in part by the Consumer Products Safety Commission
(NBSIR-85-3268) Avail: NTIS HC A04/MF A01

The literature on polyethylenes was reviewed with an emphasis on the identification of gaseous products generated under various thermal decomposition conditions and the toxicity of those products. The chemical studies of the thermal decomposition products generated under vacuum, inert and oxidative experimental conditions are described. In oxidative atmospheres, which most closely simulate real fire conditions, carbon monoxide (CO) and acrolein were found to be the predominant toxicants. The acute inhalation toxicity of combustion products from various polyethylene formulation was assessed. The combustion products generated from the polyethylenes studied in the nonflaming mode appeared to be slightly more toxic than those produced in the flaming mode. It is found that toxicity of the degradation products of polyethylenes is similar to that found for other common materials designed for the same end uses. E.A.K.

N86-20517*# Drexel Univ., Philadelphia, Pa. Dept. of Mechanical Engineering and Mechanics.
COMBUSTION CHARACTERISTICS IN THE TRANSITION REGION OF LIQUID FUEL SPRAYS Final Report, Jan. 1983 - Sep. 1985
Nicholas P. Cernansky, Izak Namer, and R. J. Tidona Jan. 1986 56 p refs
(Grant NAG3-382; Drexel Proj. 1098)
(NASA-CR-176656; NAS 1.26:176656) Avail: NTIS HC A04/MF A01 CSCL 21B

A number of important effects have been observed in the droplet size transition region in spray combustion systems. In this region, where the mechanism of flame propagation is transformed from diffusive to premixed dominated combustion, the following effects have been observed: (1) maxima in burning velocity; (2) extension of flammability limits; (3) minima in ignition energy; and (4) minima in NOx formation. A monodisperse aerosol generator has been used to form and deliver a well controlled liquid fuel spray to the combustion test section where measurements of ignition energy have been made. The ignition studies were performed on monodisperse n-heptane sprays at atmospheric pressure over a range of equivalence ratios and droplet diameters. A capacitive discharge spark ignition system was used as the ignition source, providing independent control of spark energy and duration. Preliminary measurements were made to optimize spark duration and spark gap, optimum conditions being those at which the maximum frequency or probability of ignition was observed. Using the optimum electrode spacing and spark duration, the frequency of ignition was determined as a function of spark energy for three overall equivalence ratios (0.6, 0.8, and 1.0) and for initial droplet diameters of 25, 40, 50, 60, and 70 micro m. B.W.

N86-20518*# Nebraska Univ., Lincoln. Lab. of Physics.
THE RELATIVE FLUORESCENT EFFICIENCY OF SODIUM SALICYLATE BETWEEN 90 AND 800 eV
G. C. Angel, James A. R. Samson, and G. Williams (Brookhaven National Lab., Upton, N.Y.) [1986] 16 p refs
(Grants NGR-28-002-01; NSF PHY-82-14172; NSF ATM-84-12820)
(NASA-CR-176605; NAS 1.26:176605) Avail: NTIS HC A02/MF A01 CSCL 07D

The relative fluorescent quantum efficiency of sodium salicylate was measured between 90 and 800 eV (138 -15 A) by the use of synchrotron radiation. A general increase in efficiency was observed in this spectral range except for abrupt decreases in efficiency at the carbon and oxygen K-edges. Beyond the oxygen K-edge (532 eV) the efficiency increased linearly with the incident photon energy to the limit of the present observations. Author

N86-20519# Air Force Academy, Colo.
THE WETTING BEHAVIOR OF DIALKYLIMIDAZOLIUM CHLOROALUMINATE, A ROOM TEMPERATURE MOLTEN SALT Interim Report, May - Sep. 1984
J. G. Eberhart Aug. 1985 4 p
(AD-A160254; FJSRL-JR-85-0008) Avail: NTIS HC A02/MF A01 CSCL 07/4

The wetting behavior of a battery electrolyte can have a dramatic effect on the internal resistance of the battery as well as its cycle life. Good wetting of battery separators by electrolyte is essential for easy passage of ions through the separator pores during charge and discharge. Porous, gas diffusion electrodes require, on the other hand, a lesser degree of electrolyte wetting, so that the line of contact of three phases (reactive gas/liquid electrolyte/porous electrode or current collector) can be maintained within the porous electrode through a balance of capillary and hydrostatic pressures. Advancing and receding contact angles were determined for diakylimidazolium chloroaluminate, room-temperature molten salts on various candidate battery separator and porous electrode materials. The wetting angles were determined for the binary 1-methyl-3-ethylimidazolium chloride/aluminum chloride melt as a function of such variables as composition, chlorination of the imidazolium ion, replacement of AlCl3 by LiCl, solid porosity, and solid surface cleaning procedure. In nearly all cases involving AlCl3 as a second component, the melt easily wets the substrate. GRA

N86-20520# California Univ., Berkeley. Lawrence Berkeley Lab.
THE OBSERVATION OF CH3O IN THE COLLISION FREE MULTIPHOTON DISSOCIATION OF CH3NO2
ALec M. Wodtke, Eric J. Hintsa, and Yuan T. Lee 24 Oct. 1985 11 p
(Contract N00014-83-K-0069)
(AD-A161420) Avail: NTIS HC A02/MF A01 CSCL 07/4

The method of infra-red, laser, crossed, molecular-beam, photofragmentation, translational spectroscopy has been used to study the thermal chemistry of nitromethane under collision free conditions. We have observed for the first time experimental evidence that shows that the isomerization of nitromethane to methylnitrite is an important thermochemical process in the unimolecular decomposition of the title compound. Based on theoretical predictions of Dewar et.al. that the Arrhenius pre-exponential factor is 10 to the 13.3 power, we have been able to estimate the potential energy barrier height for the isomerization reaction to be 55.5 + or - 1.5 kcal/mol, compared to the C-N bond energy of 59.2 kcal/mol. It is clear that in mechanistic modeling of the thermal decomposition of nitromethane, this important dissociation channel must be taken into consideration. We have also been able to conclusively show that previous suggestions of a dynamical barrier in the exit channel of the simple C-N bond fission reaction are in error. Author (GRA)

N86-20521# Stanford Univ., Calif. Dept. of Chemistry.
THEORY AND EXPERIMENTS ON CHEMICAL INSTABILITIES Final Technical Report, 1 Jan. 1984 - 30 Mar. 1985
John Ross 30 Jun. 1985 10 p
(Contract F49620-84-C-0030)
(AD-A162430; AFOSR-85-1001TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

Progress is reported on experiments and theoretical studies of chemical instabilities including chemical waves, photo-illuminated thermal, chemical reactions; critical slowing down, periodic precipitation processes, resonance phenomena in oscillatory reactions, rate of entropy production in systems far from equilibrium. Author (GRA)

N86-20522# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
FUEL PROPERTY EFFECTS ON COMBUSTION Final Report, Sep. 1984 - Apr. 1985
Cynthia A. Obringer Oct. 1985 20 p
(AF Proj. 304-8)
(AD-A162451; AFWAL-TR-85-2051) Avail: NTIS HC A02/MF A01 CSCL 21/4

This report deals with fuel property effects on gas turbine engine combustors. In order to increase jet fuel availability and decrease cost, the Air Force is investigating alternate feedstocks such as tar sands, shale oils, heavy oils, and coal derived fuels. As these lower quality feedstocks begin to play a major role as sources of military jet fuels, it becomes increasingly important to be able to evaluate the effects of these fuels on engine life and performance. These effects have usually been measured using expensive and time-consuming engine tests. Of major concern in each of these programs was the effects of fuel properties and composition on soot formation, and the effects of soot on engine performance and durability. Being able to predict the change in soot formation due to changing fuel properties would be an invaluable tool in future research and development efforts to eliminate soot formation and its deleterious effects on engines. The reduction in exhaust plume, through reduced soot formation, reduces a vehicle's visibility for tracking and targeting purposes, thus increasing its survivability. It was concluded that smoke and combustion linear radiative heating correlate well with hydrogen content. That hydrogen content is as effective as any parameter at predicting soot formation; and the questioning of the validity of the data, and the need for more and better data. GRA

N86-20523# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.
PHOTOCHEMICAL REACTIONS OF (n(5) PENTAMETHYLCYCLPENTADIENYL) DICARBONYLIRON-ALKYL AND -SILYL COMPLEXES: REVERSIBLE ETHYLENE INSERTION INTO AN IRON-SILICON BOND AND IMPLICATIONS FOR THE MECHANISM OF TRANSITION METAL-CATALYZED HYDROSILATION OF ALKENES
Claudia L. Randolph and Mark S. Wrighton 11 Dec. 1985 47 p
(Contract N00014-84-K-0553)
(AD-A162462; TR-8) Avail: NTIS HC A03/MF A01 CSCL 07/5

We wish to report three aspects of the photochemistry of (n5-C5Me5)Fe(CO)2R complexes, R = Me, Et, CH2CH2SiMe3 and SiMe3, which relate to a proposed mechanism for hydorsilation catalysis. These are (1) photochemically induced insertion of C2H4 into the Fe-Si bond of (n5-C5Me5)Fe(CO)2SiMe3, (2) transfer of either the -SiMe3 group or a beta-H group upon photolysis of n5-C5Me5)Fe(CO)2CH2CH2SiMe3, and (3) reductive elimination of alkane, RH, upon photoinduced oxidative addition of HSiR'3 (R' = Me, Et) to n5-C5Me5)Fe(CO)2R, R = Me, Et. GRA

N86-20524# Arizona Univ., Tucson. Dept. of Chemistry.
MIXED LIGAND CHELATE EXTRACTION OF LANTHANIDES WITH
AMINE SYSTEMS
S. Inoue, C. F. Ordonez, and H. Freiser 1985 21 p refs
(Contract DE-AC02-76ER-04073)
(DE85-014275; DOE/ER-04073/16) Avail: NTIS HC A02/MF A10

A study of the equilibrium extraction behavior of a series of representative tervalent lanthanide ions, Pr, Eu and Yb, was carried out with chloroform solutions containing N-benzoylphenylhydroxylamine, N-m-trifluromethylbenzoylhenylhydroxylamine (HL) either alone or combined with 1,10-phenanthroline (phen). The results demonstrated that the lanthanides are extracted as LnL3 x 2 HL or in the presence of phen as LnL3 x HL phen for Pr and Eu, and LnL3 x 2phen for Eu and Yb. The extraction constants, separation factors, and composition of adduct complexes for the two extractants were compared. DOE

N86-20525# Oak Ridge Gaseous Diffusion Plant, Tenn.
VAPOR-AEROSOL PHYSICOCHEMICAL LABORATORY
J. D. Lore and L. M. Skeen 1 Oct. 1985 12 p refs Presented at the 28th Oak Ridge National Laboratory Conference on Analytical Chemistry, Knoxville, Tenn., 1 Oct. 1985
(Contract DE-AC05-84OT-21400)
(DE86-000522; K/PS-5061; CONF-8510151-4) Avail: NTIS HC A02/MF A01

A laboratory capable of generating and characterizing vapors and aerosols at typical ambient concentration levels observed in chemical processing operations has been established at the ORGD Plant, operated by Martin Marietta Energy Systems, Inc. for the USDOE. A three-stage generation system (TSGS), originally developed by SRI, International, for the analytical methods validation studies sponsored by NIOSH, has been installed. Several aerosol/particulate monitors, controlled by microcomputers, provide the means for semi-real-time particle size and mass concentration measurements over the size range 0.1 to 10 microns. A full complement of chemical analysis instrumentation including laser Raman spectroscopy and gas chromatography-mass spectrometry is available for in-situ or sequential measurements of TSGS diluents. DOE

N86-20526# Los Alamos National Lab., N. Mex.
TESTING SITE SIZE REQUIREMENTS IN CHEMISORPTION: EXPERIMENT AND THEORY
C. T. Campbell, M. T. Paffett, and A. F. Voter 1985 20 p refs Presented at the 32nd National Vacuum Symposium and Topical Conference, Houston, Tex., 19 Nov. 1985
(Contract W-7405-eng-36)
(DE86-000766; LA-UR-85-3252; CONF-851174-9) Avail: NTIS HC A02/MF A01

Ensemble requirements in surface chemistry refer to the number and shape of contiguous empty sites necessary for chemisorption of a particular molecule. Ensemble effects can play a major role in directing the course of surface reactions, leading, for example, to dramatic changes in catalytic selectivity when the active metal component is diluted upon alloying with an inert metal. We will review here fundamental surface science studies that have attempted to probe this site size requirement by diluting active sites on a single crystal surface with an inert metal overlayer. We will emphasize recent results in our lab on the interaction of simple molecules (CO, H2, O2) with Cu-, Ag-, and Bi-dosed Pt(111). Theoretical models based upon Monte-Carlo simulations will be summarized which, when compared to such data, allow more accurate determination of ensemble sizes. These models predict uptake curves that deviate strongly from the commonly used (1-theta) (sup A) law (A = number of sites in ensemble), which is valid only for an array of isolated ensembles. DOE

N86-20527# Lawrence Livermore National Lab., Calif.
SUCCESSIVE REIGNITION OF FUEL-AIR MIXTURES AND PULSE COMBUSTION
C. K. Westbrook Sep. 1985 27 p refs Presented at the Two Phase Combustion, Numerical Modelling of Combustion Processes: General Combustion Topics, Davis, Calif., 21 Oct. 1985
(Contract W-7405-eng-48)
(DE86-001560; UCRL-93362; CONF-8510158-2) Avail: NTIS HC A03/MF A01

Chemical kinetic modeling of the successive reignition of fuel-air mixtures is described, under conditions of pressure and temperature very similar to those encountered in conventional pulse combustion systems. The overall system model is described and the kinetic model is discussed in some detail. Computed results for ignition delay times are then related to time scales of interest in pulse combustion. From these comparisons, some of the physical and chemical factors which control the operation of the pulse combustor can be identified and quantified. In addition, the dependence of pulse combustor performance on various system parameters can be addressed, including the mass flow rate, fuel composition, presence of selected diluents and inhibitors, and combustion chamber geometry. DOE

N86-20528# Massachusetts Inst. of Tech., Cambridge.
TEMPERATURE EFFECTS ON LITHIUM-NITROGEN REACTION

RATES

W. J. Ijams and M. S. Kazimi Aug. 1985 91 p
(Contract DE-AP07-79ID-00019)
(DE86-001848; PFC/RR-85-6) Avail: NTIS HC A05/MF A01

A series of experiments have been run with the aim of measuring the reaction rate of lithium and nitrogen over a wide spectrum of lithium pool temperatures. In these experiments, pure nitrogen was blown at a controlled flow rate over a preheated lithium pool. The pool had a surface area of approximately 4 sq cm and a total volume of approximately 6 cu cm. The system pressure varied from 0 to 4 psig. The reaction rate was very small - approximately 0.002 to 0.003 g Li min sq cm for lithium temperatures below 500C. Above 500C the reaction rate began to increase sharply, and reached a maximum of approximately 0.80 g Li min sq cm. above 700C. It dropped off beyond 1000C and seemed to approach zero at 1150C. The maximum reaction rate observed in these forced convection experiments was higher by 60% than those previously observed in experiments where the nitrogen flowed to the reaction site by means of natural convection. During a reaction, a hard nitride layer built up on the surface of the lithium pool - its effect on the reaction rate was observed. The effect of the nitrogen flow rate on the reaction rate was also observed. DOE

N86-20529# California Univ., Berkeley. Lawrence Berkeley Lab.
INTERACTION OF A LAMINAR FLAME WITH ITS SELF-GENERATED FLOW DURING CONSTANT VOLUME COMBUSTION

D. Dunn-Rankin and R. F. Sawyer Feb. 1985 23 p Presented at the 10th International Colloquium on Dynamics of Explosions and Reactive Systems, Berkeley, Calif., 4 Aug. 1985
(Contract DE-AC03-76SF-00098)
(DE85-016640; LBL-19164; CONF-850830-7) Avail: NTIS HC A02/MF A01

The formation of cusp shaped or tulip flames during closed tube flame propagation has been recorded by combustion researchers for nearly sixty years. Flame instability, pressure wave/flame interaction, and large scale circulation in the unburned gas have been suggested as explanations for the tulip flame phenomenon, but the cause of the tulip flame has not been conclusively determined. This work uses laser Doppler anemometer measurements of the flow field during flame propagation in a closed tube to describe the combustion generated flow and to support a fluid mechanical explanation for the tulip flame formation. The flame behaves as a fluid mechanical discontinuity which deflects the velocity of the gas passing through it. As the flame quenches at the side walls of the combustion vessel, the flow deflection generates a vortex in the burned gas. The vortex remains in the proximity of the flame and modifies the unburned gas field such that the flame propagates more quickly near the wall than at the center. The discrepancy in propagation rates leads to the tulip flame. DOE

N86-20530# Argonne National Lab., Ill.
SELECTIVE DETECTION OF PRIMARY AROMATIC AMINES IN COMPLEX MIXTURES BY LIQUID CHROMATOGRAPHY WITH ELECTROCHEMICAL DETECTION USING A SHORT REVERSED-PHASE COLUMN

T. Otagawa, S. Zaromb, and J. R. Stetter 1985 32 p refs Presented at the Health and Environmental Research on Complex Organic Mixtures, Richland, Wash., 21 Oct. 1985
(Contract W-31-109-eng-38)
(DE85-018351; CONF-851027-1) Avail: NTIS HC A03/MF A01

Selective detection of primary aromatic amines (PAAs) in the presence of phenols by liquid chromatography with electrochemical detection was investigated. PAAs were resolved from other aromatic compounds, using three mobile phases, at various electrode potentials and flow rates. The phases used a combination of pH and organic modifiers (tetrahydrofuran, acetonitrile, or n-propanol) to optimize the degree of separation. As the pH of the mobile phase was increased, the signals for two- and three-ring PAAs decreased and became independent of pH at values between 4 and 8, while the signals from aniline and phenols increased. Selective detection of PAAs is feasible at pH 2.2 at potentials of 0.7 to 0.85 V vs Ag/AgCl. The best result was obtained with a 35 vol % tetrahydrofuran/water mobile phase, which yielded the highest signal for aniline and the lowest signal for phenol at pH 2.2 with satisfactory retention times. Electrochemical detectors are about one thousand times more sensitive to PAAs and phenols than ultraviolet detectors. The results obtained will permit design and construction of a portable PAA monitor with an appropriate sample concentrator, pump, and injection system. DOE

N86-20531# Argonne National Lab., Ill.
FEASIBILITY STUDY: A PORTABLE HIGH-PERFORMANCE LIQUID CHROMATOGRAPH FOR ANALYSIS OF PRIMARY AROMATIC AMINES

C. L. Vila Aug. 1985 19 p refs
(Contract W-31-109-eng-38)
(DE86-001455; ANL/EES-TM-287) Avail: NTIS HC A02/MF A01

The results of this work demonstrate the feasibility of constructing and operating a portable instrument for analysis of primary aromatic amines (PAAs) in air samples containing other organic chemicals. The proposed instrumentation would use amperometric (electrochemical) detection, which is both selective for and highly sensitive to PAAs, and high-performance liquid chromatography. Three mobile-phase systems amenable to electrochemical detection and capable of resolving PAAs were tested: methanol, acetonitrile, and propanol. The system used will depend on the nature of the sample to be analyzed. Because air samples cannot be introduced directly into such an instrument, a gas sample collector and concentrator was designed. A preliminary set of experiments with a prototype concentrator system without a thermoelectric device using an air sample containing aniline resulted in 5 to 15% recovery. Additional work will be needed to improve the efficiency of the sample concentrator. DOE

N86-20532# Oak Ridge National Lab., Tenn.
ALUMINUM ELECTROCHEMISTRY IN LIQUID AMMONIA

L. Maya Sep. 1985 15 p refs
(Contract DE-AC05-84OR-21400)
(DE86-001462; ORNL/TM-9762) Avail: NTIS HC A02/MF A01

The electrochemistry of aluminum in liquid ammonia was investigated using potassium amide as supporting electrolyte. Anodic dissolution of the metal in this medium is feasible using a glassy carbon cathode and becomes significant at approximately +2.2 V from solvated electron couple. The dissolution efficiency is limited by the interference of solvated electrons which discharge at the anode. The generation of solvated electrons is one of the cathodic processes and their migration could not be completely prevented in a divided cell. In addition to this, electrodeposition of potassium at the glassy carbon cathode also takes place leading to its eventual catastrophic disintegration. This apparently takes place through the disruption of the glassy carbon structure. The presence of electroactive aluminum species produced in situ by anodic dissolution or added as LiAl(NH2)4 was detected by means of cyclic voltammetry which revealed the appearance of a cathodic response at about +100 mV from the solvent decomposition limit. DOE

N86-20533# Lawrence Livermore National Lab., Calif.
LASER SPECTROSCOPY OF GLASSES

M. J. Weber Oct. 1985 27 p refs Presented at the Symposium on Emerging Directions of Glass Research, Troy, N.Y., 10 Apr. 1985
(Contract W-7405-eng-48)
(DE86-001653; UCRL-93486; CONF-8504185-1) Avail: NTIS HC A03/MF A01

Laser spectroscopy unlike most other spectroscopies used to study amorphous solids involves selective excitation of subsets of ions and molecules having electronic transitions resonant with the laser frequency. Thus by using a tunable laser, site-to-site variations in the distribution of environments and interactions present in a glass can be probed. High resolution, highly sensitive techniques such as laser-induced fluorescence line narrowing, spectral hole burning, and coherent optical transients are providing new insights

into the spectroscopy and microscopic structure of glasses. Basic principles and recent results achieved with these unique techniques are reviewed. DOE

N86-20534# Pacific Northwest Lab., Richland, Wash.
ZIRCALOY OXIDATION STUDIES
J. T. Prater, R. H. Beauchamp, and N. T. Saenz Jun. 1985 23 p Presented at the ASM Metals Congress International Conference on Surface Modifications, Toronto, Ontario, 13 Oct. 1985
(Contract DE-AC06-76RL-01830)
(DE86-001766; PNL-SA-13372; CONF-8510160-3) Avail: NTIS HC A02/MF A01

The oxidation kinetics of Zircaloy-4 in steam have been determined at 1300 to 2400(0)C. Growth of the ZrO2 and (ALPHA)-Zr layers display parabolic behavior over the entire temperature range studied. A discontinuity in the oxidation kinetics at 1510(0)C causes rates to increase above those previously established by the Baker-Just relationship. This increase coincides with the tetragonal-to-cubic phase transformation in ZrO/sub 2-x/. No discontinuity in the oxide growth rate is observed upon melting of Zr(0). The effects of temperature gradients have been taken into account and corrected values representative of near-isothermal conditions have been computed. DOE

N86-20535# Department of Energy, Morgantown, W. Va. Energy Technology Center.
PROPAGATION PROPERTIES OF THE NONLINEAR ONE-DIMENSIONAL TRIMOLECULAR REACTION
V. Komkov Jul. 1985 13 p
(DE85-013610; DOE/METC-85/4030) Avail: NTIS HC A02/MF A01

A random walk algorithm is presented for computation of nonlinear one- (or more) dimensional trimolecular reaction partial C/partial t = D(x)Del(2)C (+) (1 - C)(2 - C)(3 - C). DOE

N86-20536# Argonne National Lab., Ill.
DIGITAL FILTERS AND THEIR LIMITATIONS IN DATA ANALYSIS FOR ELECTRON ENERGY LOSS SPECTROSCOPY
N. J. Zaluzec and J. F. Mansfield Sep. 1985 5 p Presented at the Electron Microscopy and Analysis Group Conference, Newcastle-Upon-Tyne, England, 2 Sep. 1985
(Contract W-31-109-eng-38)
(DE85-018464; CONF-8509168-2) Avail: NTIS HC A02/MF A01

It has been shown (Zaluzec, 1985) that the application of digital filters to EELS data can in many cases remove ambiguities in the interpretation of EELS data by removing the judgemental nature of the background modeling step, particularly in situations of poor edge/background ratios. Using this technique to identify the presence or absence of an edge, independent of a background model, allows the analyst to employ without serious reservation more elaborate, yet operator-defined, background modeling routines to recover the relevant characteristic edge profiles. The advantages and limitations of using these types of filters to spectral analysis of electron loss data in practical data analysis situations are briefly discussed. DOE

N86-20625# Savanna Army Depot Activity, Ill.
COMPLEXITIES OF LEAD AZIDE
W. Shaneyfelt *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosive Safety Seminar, Volume 2 Aug. 1984 p 1143-1148 (For primary document see N86-20623 11-31)
(AD-P004872) Avail: NTIS HC A99/MF E01 CSCL 13/12

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N86-20537 British Library Lending Div., Boston Spa (England).
STATISTICAL INDICES USED FOR EVALUATING THE QUALITY OF METAL
V. A. Litvinenko, I. M. Rozhkov, and G. N. Mulko 1985 11 p refs Transl. into ENGLISH from Izv. VUZ, Cheneya Metall. (USSR), no. 5, 1985 p 72-77
(BLLD-Trans-M-36510-(5828.4)) Avail: British Library Lending Div., Boston Spa, England

A procedure to determine the quality indices for metals from the results of mechanical tests on metals by different heat gradients is presented. The indices are calculated by first finding the correlational matrix of the mutual relationship between the service properties of metal and mean values of the properties for individual heats and sets of heats. Metal product quality can be improved, and the indices can be used by improving the chemical compositions of steels and the production technology. E.A.K.

N86-20538 British Library Lending Div., Boston Spa (England).
INFLUENCE OF ANNEALING SCHEDULE ON SOFTENING OF PREHARDENED AND TEMPERED HIGH-SPEED STEEL
V. I. Alimov, V. G. Onoprienko, and S. I. Marchuk [1985] 4 p refs BLLD-M-36549-Trans-(5828.4) Transl. into ENGLISH from Izvestiya VUZ Chernaya Metallurgiya (USSR), no. 6, 1985 p 95-96
Avail: British Library Lending Div., Boston Spa, Engl.

The softening of high speed steels in the initial hardened and tempered state during annealing by different schedules was studied. Softening was assessed from the results of measuring Brinell hardness and from the physical broadening of the (110) and (220) lines of the alpha phase. Author

N86-20539# Central Electricity Generating Board, London (England). Translations Section.
STRESS RELIEF CRACKING OF Cr-Mo-V STEEL
M. Nakanishi and J. Furushawa 1980 23 p refs Transl. into ENGLISH from Sumitoma Kinzoku (Japan), v. 32, no. 4, Oct. 1980 p 439-452
(BLL-CE-Trans-8171-(9022.09)) Avail: NTIS HC A02/MF A01

Stress relief (SR) annealing is commonly applied during or after the building of heavy gauge steel plate to improve welded joint performance by removing residual stress from the weld, or by softening the weld hardened zone. The SR treatment is prescribed by standard specifications for certain steels and plate thicknesses. It is found that: (1) the circular notched, constant load, rising temperature rupture test synthetic welding HAZ is an effective method for reproducing SR cracking and evaluating SR crack susceptibility; (2) the critical stress for constant load SR crack initiation (alpha sub SR) obtained from constant load rising temperature rupture tests gives on index of SR crack susceptibility to SR cracking, lower in steels of larger alpha sub SR; (3) under given welding conditions, the critical value of alpha sub SR for crack initiation may be specified irrespective of the composition; (4) the SR crack susceptibility of Cr-Mo-V is compared by alpha sub SR; (5) intragranular hardening due to precipitation hardening in SR has large effect on SR crack initiation; (6) when V is added to raise the strength of a Cr-Mo steel composition of large Cr content is recommended a steel to control SR cracking. E.A.K.

N86-20540# British Library Lending Div., Boston Spa (England).
PRESSURE OF SATURATED STEAM OF REFRACTORY METALS
R. A. Yu. Aleev, V. Balkovoi, and A. A. Manokhin [1985] 4 p refs Transl. into ENGLISH from Iz. VUZ, Chernaya Metall. (USSR), v. 5, 1985 3 p
(BLL-M-Trans-36527(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The pressure of saturated steam of niobium, molybdenum, chromium, zirconium and titanium was determined by evaporation from an uncovered surface in a vacuum. The values of the saturated steams at a given temperature were calculated from the loss of mass in the specimen by the Langmuir equation. The regulations for the temperature dependence referring to the solid state of elements are presented. E.A.K.

N86-20541*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ALLOY CHEMISTRY AND MICROSTRUCTURAL CONTROL TO

MEET THE DEMANDS OF THE AUTOMOTIVE STIRLING ENGINE Final Report
Joseph R. Stephens 1986 38 p refs Proposed for presentation at MiCon 1986, Philadelphia, Pa., 15-16 May 1986; sponsored by the American Society for Testing Materials
(Contract DE-AI01-85CE-50112)
(NASA-TM-87250; E-2892; DOE/NASA/50112-63; NAS 1.15:87250) Avail: NTIS HC A03/MF A01 CSCL 11F

The automotive Stirling engine now under development by DOE/NASA as an alternative to the internal combustion engine, imposes severe materials requirements for the hot portion of the engine. Materials selected must be low cost and contain a minimum of strategic elements so that availability is not a problem. Heater head tubes contain high pressure hydrogen on the inside and are exposed to hot combustion gases on the outside surface. The cylinders and regenerator housings must be readily castable into complex shapes having varying wall thicknesses and be amenable to brazing and welding operations. Also, high strength, oxidation resistance, resistance to hydrogen permeation, cyclic operation, and long-life are required. A research program conducted by NASA Lewis focused on alloy chemistry and microstructural control to achieve the desired properties over the life of the engine. Results of alloy selection, characterization, evaluation, and actual engine testing of selected materials are presented. Author

N86-20542*# Syracuse Univ., N. Y. Dept. of Mechanical and Aerospace Engineering.
GRAIN BOUNDARY OXIDATION AND OXIDATION ACCELERATED FATIGUE CRACK NUCLEATION AND PROPAGATION
H. W. Liu and Yoshiki Oshida Jan. 1986 19 p refs Presented at the Minnowbrook Conference on Life Prediction for High Temperature Gas Turbine Materials, Blue Mountain Lake, N.Y., 27-30 Aug. 1985 Sponsored in part by the HOST Program
(Grant NAG3-348)
(NASA-CR-175050; NAS 1.26:175050) Avail: NTIS HC A02/MF A01 CSCL 11F

Fatigue life at elevated temperatures is often shortened by oxidation. Grain boundary oxidation penetrates deeper than the surface oxidation. Therefore, grain boundary oxide penetration could be the primary cause of accelerated fatigue crack nucleation and propagation, and the shortened fatigue life at elevated temperatures. Grain boundary oxidation kinetics was studied and its statistical scatter was analyzed by the Weibull's distribution function. The effects of grain boundary oxidation on shortened fatigue life was analyzed and discussed. A model of intermittent microruptures of the grain boundary oxide was proposed for the fatigue crack growth in the low frequency region. The proposed model is consistent with the observations that fatigue crack growth rate in the low frequency region with hold time at K sub max is inversely proportional to cyclic frequency and that crack growth is intergranular. Author

N86-20543*# Clarkson Univ., Potsdam, N.Y. Dept. of Chemical Engineering.
MODELLING DIRECTION SOLIDIFICATION Semiannual Progress Report, 1 Sep. 1985 - 28 Feb. 1986
William R. Wilcox 1986 74 p refs
(Grant NAG8-541)
(NASA-CR-176606; NAS 1.26:176606; SAPR-1) Avail: NTIS HC A04/MF A01 CSCL 11F

The overall objective of this program is to develop an improved understanding of some phenomena of importance to directional solidification. The aim of this research is also to help predict differences in behavior between solidification on Earth and solidification in space. In this report, the validity of the Burton-Primslichter equation is explored. The influence of operating variables on grain and twin generation and propagation in single crystals of In sub (x) Ga sub (1-x) Sb is also investigated. B.W.

N86-20544*# National Aeronautics and Space Administration, Washington, D.C.
EFFECT OF VOLUME FRACTION AND SIZE OF FINE-GAMMA PRIME PARTICLES ON RAISING THE CREEP STRENGTH OF A DS NICKEL-BASE SUPERALLOY
D. L. Lin, D. L. Yao, X. J. Lin, and C. Q. Sun Feb. 1986 23 p refs Transl. into ENGLISH from Acta Metallurgica Sinica (Beijing, China), v. 18, no. 1, Feb. 1982 p 104-114 Previously announced in IAA as A82-33045 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Shanghai Jianotong Univ., China
(NASA-TM-77983; NAS 1.15:77983) Avail: NTIS HC A02/MF A01 CSCL 11F

The creep behavior of a directionally solidified nickel-base superalloy, DKS3, has been investigated as a function of the volume fraction and size of the gamma-prime phase at 760 and 950 C. The dislocation structure and morphology of gamma-prime was examined by transmission electron microscopy at the primary, secondary and tertiary creep stages at 73.8 kgf/sq mm. Experimental results are described in terms of a high temperature creep model in the range of temperatures and applied stresses where shearing of the gamma-prime phase does not control the straining process. Author

N86-20545# Pittsburgh Univ., Pa. Surface Science Center.
ORGANIC FUNCTIONAL GROUP REACTIVITIES AT METAL SURFACES Final Report, 1 Jul. 1982 - 30 Aug. 1985
John T. Yates, Jr. Oct. 1985 26 p
(Contract DAAG29-82-K-0141)
(AD-A161281; ARO-19250.7-CH) Avail: NTIS HC A03/MF A01 CSCL 07/4

This research has been directed toward understanding the mode of surface decomposition of organic functional groups on atomically-clean single crystal metal surfaces. In addition, the development of rapid and efficient kinetic methods to gain this information has been a goal which has been achieved. The stepwise decomposition of methanol and ethanol has been characterized on a Ni(111) single crystal surface. In addition, a Cu(111) surface has been studied for methanol decomposition behavior, and then its surface behavior has been modified systematically by oxygen adsorption. GRA

N86-20546# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Chemistry.
SPECTROSCOPIC AND ELECTROCHEMICAL STUDIES OF THE TRANSITION METAL TETRASULFONATED PHTHALOCYANINES. PART 5: VOLTAMMETRIC STUDIES OF ADSORBED TETRASULFONATED PHTHALOCYANINES (MTSPC) IN AQUEOUS SOLUTIONS Technical Report
S. Zecevic, B. Simic-Glavaski, E. Yeager, A. B. P. Lever, and P. C. Minor 1 Oct. 1985 23 p
(Contract N00014-83-K-0343)
(AD-A161357; TR-56-Pt-5) Avail: NTIS HC A02/MF A01 CSCL 07/4

Cyclic voltammetric measurements of adsorbed Fe- and Co-tetrasulfonated phthalocyanine (TsPc) and Co-phthalocyanine (Pc) have been carried out on ordinary pyrolytic graphite and silver electrodes at different solution pH ranging from 1 to 13. Many voltammetry peaks were found to be pH dependent with a slope of -59 mV/unit pH. In some instances this dependence was observed in alkaline or acid solutions only. Explanations for the various voltammetry peaks and their pH dependence are discussed. The influence of dioxygen and its reduction have also been examined. GRA

N86-20547# Columbia Univ., New York.
PRODUCTION OF FINE POWDERS FOR PERMANENT MAGNETS USING A D.C. ARC PLASMA
Huk Y. Cheh and Thomas J. Dougherty Oct. 1985 24 p
(Contract N00014-81-K-0749)
(AD-A162460) Avail: NTIS HC A02/MF A01 CSCL 11/6

Powdered feeds of iron(-100 mesh and -325 mesh) Crumac (Mn3A1C, various sieved fractions) entrained in argon were fed into a D.C. arc through a Forced Convection Cathode. The arc effluent was quenched with argon and the products collected in a cyclone and Pulsaire baghouse. The baghouse products from the iron runs are frequently pyrophoric, igniting in air. The object was

to prepare rapidly quenched, submicron powders of high coercive force for use in permanent magnets. The electrical conductivity of the feed and products proved to be the major source of difficulty in this work. The products and unvaporized feed would collect on the arc chamber walls and never reach the cyclone and baghouse. This problem was partially solved by applying a negative potential (-100 v) to the chamber. Useful product was obtainable in only five runs (three with iron, two with Crumac), near the end of this project. The products from the three iron runs were combined into two samples, one cyclone product and one baghouse product. These two samples, along with the baghouse products from the two Crumac runs were shipped to Crucible Research Division of Colt Industries. The highest surface areas of the baghouse products were 27 sq m/g for Iron and 42 sq. m/g for Crumac. The surface area was measured on samples that had been exposed to air and undoubtedly oxidized. All samples appeared to be heterogeneous, at least after exposure to air. GRA

N86-20548# Los Alamos National Lab., N. Mex.
CONSTITUTIVE RELATION FOR 6061T6 ALUMINUM UNDER SHOCK LOADING CONDITIONS
D. L. Tonks 1985 6 p Presented at the American Physics Society Topical Conference on Shock Waves in Condensed Matter, Spokane, 22 Jul. 1985
(Contract W-7405-eng-36)
(DE85-015684; LA-UR-85-2327; CONF-850736-50) Avail: NTIS HC A02/MF A01

For the first time a based on plastic flow data extracted from 6061T6 Al shocks is published. The data involves strain rates up to 10 to the 7th power and shear stresses up to 5kbar. The relation is interpreted in terms of a dislocation-kinetics model. DOE

N86-20549# Hanford Engineering Development Lab., Richland, Wash.
US-JAPAN SEMINAR ON IRRADIATION TESTING AND DEVELOPMENT OF ALLOYS FOR FUSION REACTORS
D. S. Gelles and D. G. Doran Aug. 1985 559 p Presented at the US/Japan Seminar on Radiation Testing and Development of Alloys for Fusion Reactors, Richland, Wash., 18 Mar. 1985
(Contract DE-AC06-76FF-02170)
(DE85-018214; HEDL-7555; CONF-8503149-Summ) Avail: NTIS HC A24/MF A01

Among the topics discussed at the US/Japan Seminar on irradiation testing and development of fusion reactor allys were magnetic confinement systems, properties of burning plasmas, fusion materials, and nuclear fusion technology. DOE

N86-20550# Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Lab.
EFFECTS OF TRITIUM ON MATERIAL PROPERTIES
G. R. Caskey, Jr. 1985 34 p refs Presented at the Workshop on Effects of Hydrogen on Deformation and Fracture in Metals, Los Alamos, N. Mex., 19 Aug. 1985
(Contract DE-AC09-76SR-00001)
(DE85-018532; DP-MS-85-89; CONF-8508130-1) Avail: NTIS HC A03/MF A01

The effecs of tritium on deformation and fracture of metals are reviewed with emphasis on similarities and differences between tritium and the other hydrogen isotopes. Helium generated by radioactive decay of tritium introduces time dependent property changes not observed with protium or deuterium. On-going studies and topics for further investigations are identified. DOE

N86-20551# Pacific Northwest Lab., Richland, Wash.
LIGHT-ION INDUCED HARDENING KINETICS IN IRRADIATED FERRITIC STEELS
C. H. Henager, Jr. and E. P. Simonen Oct. 1985 9 p refs Presented at the 2nd International Symposium on Environmental Degradation of Materials in Nuclear Power Systems Water Reactors, Monterey, Calif., 9 Sep. 1985
(Contract DE-AC06-76RL-01830)
(DE86-001673; PNL-SA-13101; CONF-850902-5) Avail: NTIS HC A02/MF A01

Radiation hardening was observed during creep of ferritic alloys with and without copper additions. Irradiation creep testing was combined with microhardness testing to study changes in creep strength and yield stress of two ferritic alloys. Post-irradiation creep rates and post-irradiation microhardness data confirm that significant radiation hardening occurred in both ferritic alloys due to the 673 K deuteron bombardment of 0.05 dpa. The observed hardening is attributed to growth of interstitial loops and not to growth of copper precipitates. The lack of cascade damage from light-ions may account for the lack of precipitation effects. DOE

N86-20552# Los Alamos National Lab., N. Mex.
COMBINED ELECTROCHEMICAL/SURFACE SCIENCE INVESTIGATIONS OF Pt/Cr ALLOY ELECTRODES
K. A. Daube, M. T. Paffett, S. Gottesfeld, and C. T. Campbell 1985 21 p refs Presented at the 32nd National Vacuum Symposium and Topical Conference, Houston, Tex., 19 Nov. 1985
(Contract W-7405-eng-36)
(DE86-000765; LA-UR-85-3253; CONF-851174-10) Avail: NTIS HC A02/MF A01

Chromium addition improves the performance of carbon-supported Pt electrodes for oxygen reduction in phosphoric acid fuel cells. To clarify the role of chromium and its chemical nature at the electrode surface, a combined electrochemical/surface science investigation of a series of bulk Pt(sub x)Cr(sub (1-x)) alloys (0 less than or equal to x less than or equal to 1) was performed. The surface characterization of the starting electrodes by XPS, electrochemical results from cyclic voltammetry in 85% phosphoric acid, and post-electrochemical surface characterization are described. For Cr contents less than 40%, the electrodes were quite stable up to +1.6 V vs DHE. The surface Cr was largely oxidized to Cr(+3) for surfaces at open circuit and those exposed at potentials < +1.4 V. For intermediate Cr levels, Cr was leached from the surface region by +1.5 V, leaving a porous Pt electrode with increased electrochemical hydrogen adsorption capacity. For Pt(sub 0.2)/Cr(sub 0.8), treatments at +1.4 V and above led to the appearance of Pt(4+) and Cr(6+) species, apparently stabilized in a porous phosphate overlayer up to 50 A thick. The Pt electrochemical hydrogen adsorption capacity was simultaneously increased by a factor of 15. DOE

N86-20553# Pacific Northwest Lab., Richland, Wash.
UPS OF SPUTTER-FORMED Re-1%Pd ALLOY
R. L. Gordon Sep. 1985 8 p Presented at the 13th DOE Surface Studies Conference, Dayton, OH., 8 Oct. 1985
(Contract DE-AC06-76RL-01830)
(DE86-001672; PNL-SA-13426; CONF-8510181-1) Avail: NTIS HC A02/MF A01

Ultraviolet Photoelectron Spectroscopy (UPS) has been used to obtain electron energy distribution curves (EDC's) from samples of a Re-1%Pd alloy formed by high-rate sputter deposition. The shape of He-I-induced EDC's was found to depend on surface concentration of Pd. For surfaces with Pd/Re < 0.014 the EDC is nearly identical to that of a pure Re reference sample and shows structure attributable to the rhenium density of states. With Pd/Re = 0.33 the EDC shows reduced width and exhibits a peak at 2.4 eV below the Fermi level, in keeping with behavior expected on the basis of the palladium density of states. The increase in occupation of the 2.4 eV level at the expense of higher-lying levels in both pure Re and in the low-Pd-coverage alloy is thought to be responsible for the increase in work function of the alloy which accompanies segregation of Pd to the surface. DOE

N86-20554# Pacific Northwest Lab., Richland, Wash.
LOW TEMPERATURE DEPOSITION OF TRIBOLOGICAL COATINGS
J. R. Prater Sep. 1985 16 p Presented at the ASM Metals Congress International Conference on Surface Modifications, Toronto, Ontario, 13 Oct. 1985
(Contract DE-AC06-76RL-01830)
(DE86-001767; PNL-SA-12942; CONF-8510160-2) Avail: NTIS

HC A02/MF A01

The results of microstructural and tribological studies performed on sputter-deposited coatings of ZrO2.20Y2O3, TiB2 and B-18 Si (8 at. %) are reported. In each case, deposition parameters were identified that offered good tribological properties while maintaining low deposition temperatures (<400(0)C) to avoid distortion and softening of prior heat-treated substrates. Zirconia deposits were prepared with a pronounced columnar microstructure that provided excellent thermal fatigue and wear resistance making them candidates for heat engine applications. The TiB2 coatings were the hardest coatings prepared. These provided good wear resistance on steel substrates. The B-Si coating displayed excellent wear resistance and good adherence to Cu and Al alloys. DOE

N86-20555# Washington Univ., Seattle. Dept. of Physics.
X-RAY ABSORPTION SPECTRUM OF COMPRESSED COPPER
R. Ingalls, E. D. Crozier, and A. S. Seary 1985 9 p refs Presented at the 10th High Pressure Conference on Research in High Pressure Science and Technology, Amsterdam, Netherlands, 8 Jul. 1985 Prepared in cooperation with Simon Fraser Univ., Burnaby, British Columbia
(Contract DE-FG06-84ER-45163)
(DE86-000545; DOE/ER-45163/2; CONF-850759-15) Avail: NTIS HC A02/MF A01

Recently a theoretical calculation of the X-ray absorption spectrum, XANES and EXAFS, versus pressure, has appeared for metallic copper. The theory agrees well with experiment at atmospheric pressure, and goes on to predict the response of the absorption spectrum to pressures corresponding to compressions as high as ten-fold. The authors also suggest copper to be a suitable pressure calibrant (marker) for high pressure X-ray studies by using the pressure dependence of the EXAFS features, which are calculated to vary roughly as V (sup -2/3), where V is the volume. Coincidentally, we have been using copper as pressure calibrant for X-ray absorption studies. However, we have determined the pressure by extracting the nearest neighbor bond compressibility from an analysis of the EXAFS. It should be recalled that because of the general difficulty with the ruby calibration method we have customarily used EXAFS determined bond lengths for pressure calibration. Other materials used for this purpose have been NaBr and RbCl [4,5]. DOE

N86-20556# Technische Hogeschool, Delft (Netherlands). Lab. voor Metaalkunde.
MATERIALS SCIENCE, NATURE AND POSITION OF THE SUBJECT [MATERIAALKUNDE, AARD EN PLAATS VAN HET VAK]
P. Jongenburger 1984 19 p In DUTCH
Avail: NTIS HC A02/MF A01

Materials science origin, history, future developments, and its present significance in particular with regard to energy and environment are discussed. By means of the examples of cadmium and tungsten, attention is paid to exhaustion and recovery of materials. Author (ESA)

N86-20557# Kema N.V., Arnhem (Netherlands). Dept. of Chemical Research.
DEPOSITION AND EROSION-CORROSION RIPPLING IN BOILER TUBES
W. M. M. Huijbregts and A. J. vanLoon, ed. 1985 14 p refs
(S/T-Rept-Vol-3-No-2; ISBN-90-353-0025-4; ISSN-0167-8590)
Avail: NTIS HC A02/MF A01

Experiments at an experimental installation studied effects of heat load, tube wall thickness, presence of a casing, and chemical composition of the steel on rippling. Experiments were carried out under supercritical conditions and under subcritical two-phase (water-steam) flow conditions. Two types of rippling appear: deposition rippling where ripples are formed since magnetite crystals are arranged in a ripple pattern; and erosion-corrosion rippling where the steel surface itself is erosion-corroded into a ripple pattern. Author (ESA)

N86-20558# Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium). Section Construction Metallique.
THE STRENGTH OF OXYGEN-CUT SURFACES IN AE 355 D STEELS [RESISTANCE DES TRANCHES OXYCOUPEES DES ACIERS DE QUALITE AE 355 D]
W. Chapeau (Liege Univ., Belgium), M. Hubert (Administration des Ponts et Chaussees, Belgium), and E. Piraprez Nov. 1985 122 p refs In FRENCH Sponsored by Institut pour l'Encouragement de la Recherche Scientifique dans l'Industrie et l'Agriculture, Brussells, Belgium
(CRIF-MT-162) Avail: NTIS HC A06/MF A01

Metallographic, residual stress, surface aspect, and mechanical test studies were carried out on the surface layer of oxygen cut AE 355 D steel plates in order to verify the requirement to grind-off 1 mm deep after oxygen cutting. The results show that the surface layer keeps approximately the same static strength, but the fatigue resistance is diminished by 20%. It is concluded that except for particular cases, no grind-off operation is necessary. Author (ESA)

N86-20559# Bureau of Mines, Reno, Nev.
SORPTION OF LITHIUM FROM A GEOTHERMAL BRINE BY PELLETIZED MIXED ALUMINUM-LITHIUM HYDROUS OXIDES
L. E. Schultze and D. J. Bauer 1985 20 p
(PB85-245686; BM-OFR-94-85) Avail: NTIS HC A02/MF A01 CSCL 11F

An inorganic ion exchanger was evaluated by the Bureau of Mines for recovering lithium from geothermal brines. The ion exchanger or sorbent was mixed hydrous oxide of aluminum and lithium that was dried at 100 C. The dried precipitate was pelletized with a sodium silicate binder to improve flow rates in sorption tests. The sorbent was loaded to 2 mg Li/g of pellets and sorption from the solution was independent of the concentrations of Ca, Fe, Mn, and Zn. Manganese and zinc were sorbed by the pellets but did not suppress lithium sorption. Lithium was desorbed with water, but none of the washing solutions investigated removed entrained brine without stripping lithium. The complex nature of the sorption mechanisms is discussed. GRA

N86-20418*# Applied Cryogenics and Materials Consultants, New Castle, Del.
MATERIALS AND TECHNIQUES FOR MODEL CONSTRUCTION
D. A. Wigley *In* AGARD Special Course on Cryogenic Technology for Wind Tunnel Testing Jul. 1985 19 p refs Previously announced in IAA as N85-31066 Sponsored in part by NASA (For primary document see N86-20415 11-09)
Avail: NTIS HC A18/MF A01 CSCL 14B

N86-20419*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DESIGN AND CONSTRUCTION OF MODELS FOR THE NATIONAL TRANSONIC FACILITY, PART 1
Clarence P. Young, Jr. *In* AGARD Special Course on Cryogenic Technology for Wind Tunnel Testing Jul. 1985 17 p refs Sponsored in part by NASA (For primary document see N86-20415 11-09)
Avail: NTIS HC A18/MF A01 CSCL 11F

N86-20899# Joint Publications Research Service, Arlington, Va.
MECHANISM OF FIXATION OF Mn AND Fe ON SURFACE OF FERROMANGANESE NODULES Abstract Only
A. A. Morozov *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 21 Transl. into ENGLISH from Doklady Akademii Nauk SSSR (Moscow, USSR), v. 282, no. 3, May 1985 p 688-692 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

N86-20911# Joint Publications Research Service, Arlington, Va.
GEOCHEMISTRY DISCOVERY OPENS WAY TO NEW MINING OF RARE METALS
Sh. Muladzhanov *In its* USSR Report: Earth Sciences

(JPRS-UES-86-001) 10 Jan. 1986 p 32-33 Transl. into ENGLISH from Moskovskaya (Moscow, USSR), 20 Sep. 1985 p 1 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N86-20560* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
COPOLYMERS OF VINYL STYRYLPYRIDINES OR VINYL STILBAZOLES WITH BISMALEIMIDE Patent
John A. Parker, Alvin H. Heimbuch, Ming-Ta S. Hsu, and Timothy S. Chen, inventors (to NASA) Issued 2 Jul. 1985 11 p Filed 18 Nov. 1983
(NASA-Case-ARC-11429-1-CU; US-Patent-4,526,925; US-Patent-Appl-SN-553339; US-Patent-Class-524-548; US-Patent-Class-525-186; US-Patent-Class-526-262; US-Patent-526-265) Avail: US Patent and Trademark Office CSCL 11B

Vinyl pyridines including vinyl stilbazole materials and vinyl styrylpyridine oligomer materials are disclosed. These vinylpyridines form copolymers with bismaleimides which copolymers have good fire retardancy and decreased brittleness. The cure temperatures of the copolymers are substantially below the cure temperatures of the bismaleimides alone. Reinforced composites made from the cured copolymers are disclosed as well.
Official Gazette of the U.S. Patent and Trademark Office

N86-20561* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
HIGH TEMPERATURE POLYIMIDE FILM LAMINATES AND PROCESS FOR PREPARATION THEREOF Patent
Anne K. StClair and Terry L. StClair, inventors (to NASA) Issued 24 Sep. 1985 15 p Filed 24 Oct. 1984 Continuation-in-part of abandoned US-Patent-Appl-SN-189234, filed 22 Sep. 1980
(NASA-Case-LAR-13384-1; US-Patent-4,543,295; US-Patent-Appl-SN-663840; US-Patent-Class-428-458; US-Patent-Class-156-307; US-Patent-Class-256-308.2; US-Patent-Class-156-309.9; US-Patent-Class-156-331.5; US-Patent-Class-427-385.5; US-Patent-Class-427-388.1; US-Patent-Class-428-473.5) Avail: US Patent and Trademark Office CSCL 11D

High temperature polyimide film laminates and a process for fabricating large-area, void-free polyimide laminate structures wherein multiple-ply polyimide film laminates may be constructed without decreasing the individual film strength and wherein layers of metal foil may be laminated between polyimide film layers to yield a flexible high temperature resistant structure having capabilities for use as flexible electric circuits, in aerospace applications, and the like.
Official Gazette of the U.S. Patent and Trademark Office

N86-20562# Massachusetts Inst. of Tech., Cambridge. School of Engineering.
FRACTURE MECHANICS IN PVC AND OTHER THERMOPLASTICS
L. H. Lee, F. J. McGarry, and J. F. Mandell Jun. 1985 155 p refs Sponsored by the Dow Chemical Co.
(PPST-85-8) Avail: NTIS HC A08/MF A01

Multiple crazing was the principle nonelastic deformation mechanism occurring at crack tips of polyvinyl chloride (PVC) pipe materials under plane strain conditions. Direct correlation between multiple crazing and macroscopic fracture toughness value was established based on fracture properties of several thermoplastic polymers. Formation of multiple crazes at the crack tip serves as an energy absorption mechanism which enhances fracture toughness value of a polymer. Failure mechanisms of polymers which form multiple crazes were shown to be broadly similar. Transition from multiple to single crazing occurs prior to catastrophic failure, and the mode of crack propagation changes correspondingly from stable to unstable. Factors governing transition in PVC were investigated by studying craze initiation and growth and velocities of crack propagation before and after instability. Fracture toughness value of PVC can be estimated from the number of crazes formed and from craze properties as determined by use of interference microscopy and electron microscopy. The effect on craze properties of PVC microstructure, specifically crystallinity and molecular entanglement, was investigated. Author

N86-20563# Massachusetts Inst. of Tech., Cambridge. School of Engineering.
ELASTOMER COATED FILLER AS TOUGHNESS MODIFIER IN GLASSY POLYMERS
F. J. McGarry and Kwan Tse Ming (Dow Chemical Co.) Mar. 1985 203 p refs Sponsored by Dow Chemical Co.
(PPST-85-10) Avail: NTIS HC A10/MF A01

An elastomer coated A-glass, microsphere-filler epoxy was investigated. A gamma-mercaptopropyltrimethoxy silane coupling agent was used to treat two micron A-glass microspheres, followed by a coating of carboxyl terminated butadiene acrylonitrile (CTBN) elastomer in methyl ethyl ketone solvent. After the stepwise solution coating, gravimetric analysis, scanning electron microscopy and energy dispersive X-ray analysis were employed to determine the presence, completeness, uniformity, adhesion and thickness of the coating, which were found to be adequate. The coated microsperes were dispersed in Epon 828 epoxy prepolymer which was cured with Curing Agent D. The mechanical properties of the elastomer-filler-epoxy were compared to those of elastomer-epoxy, the filler-epoxy and the unmodified epoxy control. The fracture surface work of the elastomer-filler-epoxy was higher than that of other samples, based on the amount of elastomer used. The toughening action was accompanied by an increase in modulus, with minimal sacrifice of elongation to break and tensile strength. The test results were considered in the context of fractographic studies and existing theoretical models. A basis for a new and cost effective approach to polymer toughening was established.
Author

N86-20564*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THERMOPLASTICS/THERMOSETTING ADHESIVE SPECIMEN BONDING Patent Application
Bland A. Stein, Robert L. Fox, John D. Buckley, Linwood G. Burcher, James R. Tyeryar, S. Elmo Sterling, Jr., inventors (to NASA), Spencer V. Inge, Jr., and Robert E. Wright, Jr. Filed 29 May 1985 37 p
(NASA-Case-LAR-13066-1; NAS 1.71:LAR:13066-1; US-Patent-Appl-SN-738816) Avail: NTIS HC A03/MF A01 CSCL 11A

An induction heating, pressure bonding apparatus for bonding specimens of similar or dissimilar material compositions is disclosed. Specimens are sandwiched about an adhesive impregnated susceptor, and then placed within a specimen fixture. The fixture is inserted into a press, and power is supplied to a toroid induction heater. The induction heater emits electromagnetic energy which passes through a susceptor, thereby heating the susceptor and melting the impregnating adhesive. Pressure is simultaneously applied via a hydraulic jack, and the melted adhesive thoroughly wets the inner bonding surfaces of the specimens. Either thermosetting or thermoplastic adhesives may be used, and short bonding times are obtained due to the utilization of induction heater. NASA

N86-20565*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
POLYIMIDES CONTAINING ATBN ELASTOMETERS AND THE PROCESS FOR PREPARING SAME Patent Application
Anne K. St.Clair, Stephen A. Ezzell, Terry L. StClair, and Jeffrey A. Hinkley, inventors (to NASA) Filed 23 Aug. 1985 22 p
(NASA-Case-LAR-13178-1; NAS 1.71:13178-1; US-Patent-Appl-SN-768771) Avail: NTIS HC A02/MF A01

CSCL 11B

High temperature linear aromatic polyimides and the process for preparing same through a solvent solution or by molten reaction are disclosed. By incorporation of relatively small amounts (1 to 25% by weight) of amine terminated butadiene/acrylonitrite (ATBN) elastomer into the linear polyimide backbone, an otherwise hard to process polymer is rendered readily processable. Cast films of the polyamic acid solution exhibit improved tear resistance with 1 to 15% by weight of the ATBN elastomer. NASA

N86-20566*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
COPOLYIMIDES WITH A COMBINATION OF FLEXIBILIZING GROUPS Patent Application
Terry L. St.Clair, Harold D. Burks, and Donald J. Progar, inventors (to NASA) Filed 20 Jun. 1985 23 p
(NASA-Case-LAR-13354-1; NAS 1.71:LAR-13354-1; US-Patent-Appl-SN-746901) Avail: NTIS HC A02/MF A01 CSCL 11B

Novel copolyimides are prepared by reacting one or more aromatic dianhydrides with a metasubstiuted phenylene diamine and an aromatic bridged diamine. The incorporation of metasubstituted phenylene diamine derived units and bridged aromatic diamine derived units into the linear aromatic polymer backbone results in a copolyimide of improved flexibility, processability, and melt-flow characteristics. The novel copolyimides are especially useful as thermoplastic hot-melt adhesives. NASA

N86-20567*# Boeing Aerospace Co., Seattle, Wash.
EVALUATION OF HIGH TEMPERATURE STRUCTURAL ADHESIVES FOR EXTENDED SERVICE, PHASE 4 Final Report, 15 Oct. 1983 - 15 Oct. 1985
C. L. Hendricks, S. G. Hill, and J. N. Hale Oct. 1985 56 p refs (Contract NAS1-15605)
(NASA-CR-177936; NAS 1.26:177936) Avail: NTIS HC A04/MF A01 CSCL 11A

The evaluation of three phenylquinoxaline polymers as high temperature structural adhesives is presented. These included an experimental crisskubjabke oiktner (X-PQ) and two experimental materials (PPQ-2501) and (PPQ-HC). Lap shear, crack extension, and climing drum peel specimens were fabricated from all three polymers, and tested after thermal, combined thermal/humidity, and stressed Skydrol exposure. All three polymers generally performed well as adhesives at initial test temperatures from 219K (-67 F) to 505K (450 F) and after humidity exposure. The 644K (700 F) cured test specimens exhibited superior Skydrol resistance and thermal stability at 505K (450 F) when compared to the 602K (625 F) cured test specimens. Author

N86-20568*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPOSITION OPTIMIZATION OF SELF-LUBRICATING CHROMIUM CARBIDE-BASED COMPOSITE COATINGS FOR USE TO 760 DEG C Final Report
Chris DellaCorte and Harold E. Sliney 1986 27 p refs Proposed for presentation at the American Society of Lubrication Engineers Annual Meeting, Toronto, Ontario, 12-15 May 1986
(Contract DE-AI01-85CE-50112)
(NASA-TM-87261; E-2953; DOE/NASA/50112-64; NAS 1.15:87261) Avail: NTIS HC A03/MF A01 CSCL 11H

This paper describes new compositions of self-lubricating coatings that contain chromium carbide. A bonded chromium carbide was used as the base stock because of the known excellent wear resistance and the chemical stability of chromium carbide. Additives were silver and barium fluoride/calcium fluoride eutectic. The coating constituents were treated as a ternary system consisting of: (1) the bonded carbide base material, (2) silver, and (3) the eutectic. A study to determine the optimum amounts of each constituent was performed. The various compositions were prepared by powder blending. The blended powders were then plasma sprayed onto superalloy substrates and diamond ground to the desired coating thickness. Friction and wear studies were performed at temperatures from 25 to 760 C in helium and hydrogen. A variety of counterface materials were evaluated with the objective of discovering a satisfactory metal/coating sliding combination for potential applications such as piston ring/cylinder liner couples for Stirling engines. Author

N86-20569# Department of the Navy, Washington, D. C.
CONDUCTIVE HETEROCYCLIC LADDER POLYMERS Patent Application
Oh-Kil Kim, inventor (to Navy) Filed 30 May 1985 10 p
(AD-D011915; US-Patent-Appl-SN-739354) Avail: NTIS HC A02/MF A01 CSCL 07/3

The present invention pertains generally to electroactive materials and in particular to electroactive organic ladder polymers. The electrical properties of organic polymers have attracted a great deal of attention from the scientific and industrial communities. Conductive polymers would be useful for the production of light weight batteries for electric vehicles and for use in place of metallic conductors aboard aircraft, where weight is and important consideration. They may also prove useful where corrossion resistance is required. It is one object of this invention to obtain and organic ladder polymer with high electrical conductivity. It is a further object of this invention to obtain a conductive ladder polymer that is stable against both thermal and chemical degradation. Phenothiazine Ladder Polymer, PTL (or di-chloro-PTL) was prepared by polycondensation of 2,5-diamino-1, 4-benzenedithiol with 2,5 dichloro (or 2,3,5,5-tetrachloro)-p-benzoquinone in polyphosphoric acid at 250 C. Phenoxazine Ladder Polymer, POL, was prepared from 2,5-dichloro-p-phylendiamine and 2,5-dihydroxy-p-benezoquinone under the same conditions as used for PTL synthesis. Di-chloro-POL and other derivatives can be made under a similar condition. These polymers conduct electricity. GRA

N86-20570*# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Structures Lab.
DEVELOPMENT OF TWO CANDIDATE CONCRETE MIXTURES (SALT, NONSALT) FOR REPOSITORY SEALING APPLICATIONS Final Report
A. D. Buck Aug. 1985 59 p
(Contract DE-AI97-81ET-46633)
(AD-A160692; WES/MP/SL-85-8) Avail: NTIS HC A04/MF A01 CSCL 11/2

Two concrete mixtures were developed in 1983 for possible use in nuclear waste repository sealing application. The salt concrete was basically an adaptation of BCT 1-F salt grout made by adding aggregate. The nonsalt mixture was a similar adaptation of nonsalt BCT 1-FF grout. The basic requirement was continued workability after 2 hr of intermittent mixing. Tests of hardened specimens included strength, modulus of elasticity (E), permeability, coefficient of linear thermal expansion, thermal conductivity, expansion, creep, and examinations by X-ray diffraction for phase composition and by scanning electron microscopy for microstructure. Some of the physical tests were done on specimens that had been kept at 23 + or - 1.7 deg C and on other specimens kept at 61 + or - 2 deg C. Tests for expansion and examinations for phase composition and microstructure are being continued at 6-month or yearly intervals. It was concluded that each concrete mixture was a viable candidate for use in repository sealing applications. Author (GRA)

N86-20571# Pennsylvania State Univ., University Park.
RESIDUAL STRESSES AND ELASTIC PROPERTIES IN POLYCRYSTALLINE MATERIALS Final Report, 10 Aug. 1981 - 9 Aug. 1984
E. K. Graham and R. C. Bradt 16 Aug. 1985 21 p
(Contract DAAG29-81-K-0159)
(AD-A161446; ARO-17708.1-MS) Avail: NTIS HC A02/MF A01 CSCL 20/11

The primary objective of this research program was to assess and develop the use of high-precision ultrasonic interferometery as a means of evaluating the internal residual stresses in polycrystalline materials. The method which was pursued involved the comparison of the elastic properties of the polycrystalline solid with those inferred for the stress-free aggregate from single-crystal

data used in conjunction with and appropriate theoretical averaging scheme. Another approach, based on residual stress-induced transverse isotropy, also was evaluated. A primary problem with all acoustic approaches is associated with effects arising from microstructural characteristics. In the present study, accurate microstructure characterization and theoretical models were utilized to account for these effects. Residual stress evaluation by the photoelastic method was employed also as an independent means of comparison. Work in this study was limited to MgAl2O4 spinel, which was available in high-quality single-crystal specimens and polycrystalline blanks. Extensive sets of elastic property data were obtained as functions of both temperature and pressure for numerous specimens of single-crystal and polycrystalline spinel. Ourt single-crystal second-order elastic constant results for stoichiometric spinel compared favorably with those from previous studies. The higher-order property results, particularly with respect to temperature, are new and provide useful insight relevant to the high P,T equation of state. GRA

N86-20572# La Jolla Inst., Calif. Center for the Study of Nonlinear Dynamics.
STRETCHING OF MACROMOLECULES IN TURBULENT FLOWS
Yitzhak Rabin and Frank S. Henyey 15 Nov. 1985 17 p
(Contract MDA903-84-C-0373)
(AD-A161800; LJI-R-85-358) Avail: NTIS HC A02/MF A01 CSCL 20/4

We have investigated the behavior of dilute polymer solutions in flows which are strong in sense that they can induce a significant deformation of the macromolecules. The rationale for this approach is that since turbulent flows are laminar on sufficiently small scales (such as the size of a polymer). The stretching of polymers by elongational flow bursts within the turbulent fluid can be studied by examining the behavior of polymers in simple (laminar) elongational flows. The stretching, in turn, is a necessary condition for the flow to be significantly affected by the addition of minute quantities of polymer; this is true regardless of the details of the mechanism leading to drag reduction (DR) and is a consequence of the observation that flow modification appears when the volume fraction of the polymers exceeds unity, i.e., when the polymers are strongly overlapping (in a dilute solution this condition is satisfied only for stretched polymers). We investigated the stretching of polymers (the so-called coil stretching transition) in elongational flows using a combination of physical (scaling type) and chemical (molecular level description in terms of local conformational states) techniques. This report summarizes the ones that are the most important in the context of DR, and flow modification in general. GRA

N86-20573# Department of the Army, Washington, D. C.
OXYNITRIDE GLASS FIBERS Patent Application
Donald R. Messier and Eileen J. Deguire, inventors (to Army) Filed 12 Sep. 1985 17 p
(AD-D011956; US-Patent-Appl-SN-775076) Avail: NTIS HC A02/MF A01 CSCL 11/2

This invention relates to the production of high elastic modulus, high strength, corrosion-resistant oxynitride glass fibers for improved fiber-reinforced composites. The incorporation of nitrogen into silicon-yttrium-aluminum oxide glasses enhances the properties of bulk glass. This invention is the first demonstration that such glasses can be made into fibers. The addition of nitrogen to practically any oxide glass fiber composition will produce improvements in properties similar to those shown for the silicon-yttrium-aluminum system. GRA

N86-20574# Princeton Univ., N. J. Dept. of Chemical Engineering.
TIME-TEMPERATURE-TRANSFORMATION (TTT) CURE DIAGRAMS: RELATIONSHIP BETWEEN T SUB g AND THE TEMPERATURE AND TIME OF CURE FOR EPOXY SYSTEMS Technical Report, Nov. 1984 - Dec. 1985
Xinsheng Peng and J. K. Gillham Dec. 1985 28 p
(Contract N00014-84-K-0021)
(AD-A162428; TR-5) Avail: NTIS HC A03/MF A01 CSCL 11/9

A procedure is provided for estimating the time to full cure versus isothermal cure temperature for vitrified epoxy systems. An equation relating the glass transition temperature of vitrified epoxy systems to the time and temperature of cure is developed. Author (GRA)

N86-20575# Sandia National Labs., Albuquerque, N. Mex.
THE EFFECT OF ALTERNATIVE AGING AND ACCIDENT SIMULATIONS ON POLYMER PROPERTIES
L. D. Bustard, J. Chenion (CEA-ORIS-LABRA at Saclay, Gif-sur-Yvette, France), F. Carlin (CEA-ORIS-LABRA at Saclay, Gif-sur-Yvette, France), C. Alba (CEA-ORIS-LABRA at Saclay, Gif-sur-Yvette, France), G. Gaussens (CEA-ORIS-LABRA at Saclay, Gif-sur-Yvette, France), and M. LeMeur (CEA-DAS-SAF, Fontenay-aux-Roses, France) May 1985 174 p refs
(Contract WRC-FIN-A-1051)
(TI85-014726; NUREG/CR-4091; SAND-84-2291) Avail: NTIS HC A08/MF A01

The influence of accident irradiation, steam, and chemical spray exposures on the behavior of twenty-three age-preconditioned polymer sample sets (twenty-one different materials) has been investigated. The test program varied the following conditions: (1) accident simulations of irradiation and thermodynamic (steam and chemical spray) conditions were performed both frequentially and simultaneously; (2) accident thermodynamic (steam and chemical spray) exposures were performed both with and without air present during the exposures; (3) sequential accident irradiations were performed both at 28 C and 70 C; (4) age preconditioning was performed both sequentially and simultaneously; (5) sequential aging irradiations were performed both at 27 C and 70 C; and (6) sequential aging exposires were performed using two sequences: (1) thermal followed by irradiation and (2) irradiation followed by thermal. Both general trends applicable to a majority of the tested materials as well as specific results for each polymer are reported. Author

N86-20576# Sandia National Labs., Albuquerque, N. Mex.
QUANTITATIVE ANALYSIS OF HYDROXYL AND BORON IN S GLASS-CERAMIC BY FOURIER TRANSFORM INFRARED SPECTROSCOPY
M. C. Oborny Jul. 1985 27 p refs
(Contract DE-AC04-76DP-00789)
(DE86-001148; SAND-85-0738) Avail: NTIS HC A03/MF A01

Fourier transform infrared (FT-ir) spectroscopy has been used to analyze hydroxyl and boron content in samples of S glass-ceramic, which is used in making glass-to-metal seals in the MC3753 actuator. Hydroxyl and boron concentrations in S glass-ceramic have a large effect on the final properties of the glass-ceramic. Therefore, a rapid and accurate method of analysis for these components is desirable for process monitoring. Our studies have found a direct correlation between OH content and bubble formation in S glass-ceramic which has been used to identify critical manufacturing parameters necessary for eliminating bubble formation in the S glass-ceramic during formation of glass-to-metal seals. A lower energy absorption band in S glass-ceramic near 2685 cm(-1) due to the first overtone of the B-O stretching vibration was used to determine boron concentration. Although the accuracy is slightly lower using FT-ir, it is a much more rapid technique than ion chromatography exclusion for the analysis of boron in S glass-ceramic and thus is more appropriate for measurements on large numbers of samples. DOE

N86-20577# Technische Hogeschool Twente, Enschede (Netherlands). Tribology Lab.
TRACTION IN ELASTOHYDRODYNAMIC LUBRICATION. HIGH CONTACT PRESSURE EXPERIMENTS AND A THERMAL ROELANDS-EYRING-MAXWELL MODEL
P. Klein Meuleman, A. A. Lubrecht, and W. E. tenNapel Mar. 1985 33 p refs Sponsored by SKF-ERC, Nieuwegein, The Netherlands
(RR-WB-85-15) Avail: NTIS HC A03/MF A01

Traction experiments for an intermediate and a low viscosity lubricant were carried out on a disk-machine. It is shown that the

results can be explained by a thermal Roelands-Eyring-Maxwell model for the lubricant. The order of magnitude of the Eyring shear stress is 1 MPa, and the elastic shear modulus is 10 MPa. The elastic shear modulus of the lubricants increases with pressure and decreases with temperature. The Eyring shear stress increases with temperature and exhibits a small tendency to decrease with increasing pressure. The very thin lubricant shows a much stronger decreasing tendency, but more results are needed. Author (ESA)

N86-20578# National Bureau of Standards, Gaithersburg, Md. Office of Standard Reference Materials.
GLASS FIBERBOARD SRM (STANDARD REFERENCE MATERIALS) FOR THERMAL RESISTANCE Final Report
J. G. Hust Aug. 1985 35 p refs
(PB86-107430; NBS/SP-260-98; LC-85-600566) Avail: NTIS HC A03/MF A01; also Avail: SOD HC as 003-003-02674-3 CSCL 11B

The apparent thermal conductivity data that provided the basis for the certification of glass fiberboard as an SRM of thermal resistance are reported and analyzed. New data for the extension of the temperature range of this SRM to 100 K are included. Detailed analysis and intercomparisons of previously described NBS and other published data are given. These data are represented by an equation describing the dependencies of the data on temperature and density. Certified values of thermal resistance are given for temperature from 100 to 300 K and densities from 113 to 145 kg/cu m. Author (GRA)

N86-20946# Joint Publications Research Service, Arlington, Va.
RESEARCH ON FIRE RESISTANT PLASTIC MOLDING COMPOUNDS
Wieslaw Nowaczek and Waclaw Krolikowski *In its* East Europe Report (JPRS-EER-86-007) 17 Jan. 1986 p 155-156 Transl. into ENGLISH from Chemik (Gliwice, Poland), no. 8, Aug. 1985 p 199-203 (For primary document see N86-20946 11-43)
Avail: NTIS HC A09/MF A01

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N86-20579# Mueller Associates, Inc., Baltimore, Md.
GASOLINE OCTANE ENHANCEMENT: TECHNOLOGY, ECONOMICS, AND ENVIRONMENTAL, HEALTH AND SAFETY CONSIDERATIONS
Peter McCallum, Joseph A. Mulloney, Jr., Daniel L. Raley, and Linda L. Green Jul. 1985 106 p refs
(Contract DE-AC01-84PE-72013)
(DOE/PE-72013/1) Avail: NTIS HC A06/MF A01

Basic data on gasoline octane enhancement technology and other information on the environmental, health, and safety considerations in the use of octane-improving components are provided. Recent events, including some regulatory actions by the U.S. Environmental Protection Agency (EPA) in accelerating the phasedown of organic lead compounds as octane boosters and the avilability of new compounds and classes of compounds suitable for use as octane boosters, have incided renewed interest in this whole area. Furthermore, on the commercial side, considerable financial gains and losses are at stake for companies manufacturing or purchasing properietary octane boosters. Thus, the economics of octane components is integrally tied to their use and must be taken into consideration in any review of these compounds. In addition to the technical and economic considerations that have relevance to decisions about how to supply the octane needed to achieve gasoline grade standards, there a number of regulatory and competitive forces that must be taken into account. Author

N86-20580# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
PRODUCIBILITY AND COST STUDIES OF AVIATION KEROSENE
Cecil C. Rosen, III, ed. Jul. 1985 51 p refs
(AGARD-AR-227; ISBN-92-835-1504-8) Avail: NTIS HC A04/MF A01

A computer analysis conducted by Exxon Research and Engineering Company and NASA used standard refinery planning methods to determine the optimum processing path within model refineries to achieve minimum cost for various product outputs. Crude feedstock types were combined and refinery configurations selected to create regional calculation models. Principal objectives were: to determine the effect of jet fuel quality variations on the maximum yield of jet fuel; to determine the effect of jet fuel quality variations on refining costs for regional models based on future supply and demand; and to determine, for the United States Air Force, the effect of changing from wide cut (naptha) to kerosene jet fuels on refining cost and production yield in the United States and Europe. B.G.

N86-20581# Southwest Research Inst., San Antonio, Tex.
REAL-TIME QUALITY CONTROL OF ANTIMISTING KEROSENE (AMK) Final Report, Feb. 1983 - Jan. 1985
R. J. Mannheimer Dec. 1985 58 p refs
(DOT/FAA/CT-85/5) Avail: NTIS HC A04/MF A01

This report discusses the results of a program to develop real-time quality-control tests for antimisting fuels. Die-swell and torsional balance experiments were performed to compare the shear and normal stress developed by antimisting kerosene (0.3 percent FM-9 + glycol/amine in Jet A) and 0.1 percent ARCO in Jet A. Capillary tube experiments show that AMK shear thickness at a critical shear rate, reaches a maximum visosity, and then shear thins at higher shear rates. Furthermore, it is established that AMK made with an improved FM-9 polymer has a lower critical shear rate, a higher maximum viscosity, a larger viscoelastic end corrections than AMK made with the original FM-9 polymer. Based on die-swell experiments, the outstanding rheological property of both antimisting fuels at high shear rates is the development of normal stresses that are 20 to 40 times larger than shear stresses. Experiments were conducted to determine the effect of polymer concentration and methods of blending on the rheological properties of AMK. This approach has shown that the critical velocity for in-line blended AMK (age- 30 minutes) is only slightly lower than for batch-blended AMK at the same specific degrader power. Author

N86-20582# National Aerospace Lab., Tokyo (Japan). HMX Propellant Research Group.
THE FUNDAMENTAL STUDY OF HMX COMPOSITE PROPELLANT AND ITS PRACTICAL APPLICATION
1985 58 p refs In JAPANESE; ENGLISH summary
(NAL-TR-875; ISSN-0389-4010) Avail: NTIS HC A04/MF A01

Synthetic research on HMX composite propellants is described, from the fundamental investigation of propellent burning mechanisms to the demonstration firing test of a full-scale apogee motor. First, the safety and physical properties were examined. By using a new bonding-agent between HMX and HTPB binder for HMX composite propellants, detonability was held in the same manner s the standard propellant without HMX, and some mechanical properties were improved. Second, burning experiments of various HMX/binder strands were made and from these results the mechanisms of lowering the burning rate of HMX composite propellants was discussed. Third, firing tests of small-scale rocket motors were conducted under the atmospheric condition for obtaining fundamental combustion characteristics. An example of these characteristics is the absence of combustion instability. Finally, a full-scale (760 mm dia.) spherical motor was tested by means of the high altitude test facility. The specific impulse under the vacuum condition was 2.90 KN.s/kg(296kgf.s/kg) at a nozzle expansion ratio of 70. Author

N86-20583# Monsanto Research Corp., Miamisburg, Ohio. Mound.
THERMOGRAPHIC OBSERVATION OF HYDROCARBON OXYGEN EXPLOSIONS
L. D. Abney, M. D. Kelly, and J. H. Mohler 1985 4 p Presented at the 8th Thermosense Conference, Cambridge, Mass., 16 Sep. 1985
(Contract DE-AC04-76DP-00053)
(DE86-001757; MLM-3296(OP); CONF-8509181-1) Avail: NTIS HC A02/MF A01

Balloons containing methane-oxygen mixtures were detonated to simulate ordinance fireballs. To establish fireball characteristics, analyses were required of reacting temperatures, thermal profiles, and mixing patterns of the methane-oxygen products with the atmosphere. Infrared videothermography measured and recorded the detonation and gas cloud mixing. Image digitization and in-band energy calculations were done to compare reaction parameters for different balloon tests. DOE

N86-20584# Instituto Nacional de Tecnica Aeroespacial, Madrid (Spain). Lab. de Propulsantes y Explosivos.
SINGLE AXIS MECHANICAL CHARACTERIZATION OF A NEW FORMULATION OF PLASTIC PROPELLANTS [CARACTERIZACION MECANICA UNIAXIAL DE UNA NUEVA FORMULACION DE PROPULSANTE PLASTICO]
Carlos Schuller Gil and Eugenia Martin-SanzMartinez 1985 14 p refs In SPANISH
Avail: NTIS HC A02/MF A01

The extension of the lower temperature limit was subjected to experimentation formulating a double base solid propellant based on CIS 1,4 polyisoprene. The mechanical test temperature range was -70 C to 70 C and the test deformation velocities were from 0.1 to 10 mm/sec. The results show a performance superior to that of polyisobutylene. Low temperature extensibility and high temperature tensile strength are acceptable over a much wider temperature range. Author (ESA)

N86-20596# Messerschmitt-Boelkow G.m.b.H., Munich (West Germany).
SENSITIVITY OF HIGH EXPLOSIVES AGAINST HOT FRAGMENTS
M. Held and T. K. Rosendorfer *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 225-248 (For primary document see N86-20589 11-31)
(AD-P004827) Avail: NTIS HC A99/MF E03 CSCL 19/4

N86-20597# Aerojet Tactical Systems, Sacramento, Calif.
ATEX: A CASTABLE INSENSITIVE HIGH EXPLOSIVE
J. W. Barry and G. A. Zimmerman *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 249-258 (For primary document see N86-20589 11-31)
(AD-P004828) Avail: NTIS HC A99/MF E03 CSCL 19/4

N86-20598# Societe Nationale des Poudres et Explosifs, Vert-Le-Petit (France).
METHOD OF PREDICTION OF THE EXPLOSIVE BEHAVIOR OF HIGHLY CONFINED PBXS SUBMITTED TO BULLET IMPACT
P. Monteagudo *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 259-283 (For primary document see N86-20589 11-31)
(AD-P004829) Avail: NTIS HC A99/MF E03 CSCL 19/4

N86-20599# Health and Safety Executive, London (England).
THE UNITED NATIONS MANUAL OF TESTS FOR CLASSIFICATION OF EXPLOSIVES
R. R. Watson *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 285-291 (For primary document see N86-20589 11-31)
(AD-P004830) Avail: NTIS HC A99/MF E03 CSCL 19/4

N86-20600# Health and Safety Executive, London (England).
CLASSIFICATION REQUIREMENTS FOR THE IMPORTATION OF EXPLOSIVES INTO THE UNITED KINGDOM
A. R. Duckworth *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 293-302 (For primary document see N86-20589 11-31)
(AD-P004831) Avail: NTIS HC A99/MF E03 CSCL 19/4

N86-20602# Ministry of Defence, London (England).
CLASSIFICATION OF EXPLOSIVES IN ACCORDANCE WITH INTERNATIONAL SYSTEM
W. S. N. Tinkler *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 313-323 (For primary document see N86-20589 11-31)
(AD-P004833) Avail: NTIS HC A99/MF E03 CSCL 19/4

N86-20609# Lawrence Livermore National Lab., Calif.
DOE HAZARD CLASSIFICATION FOR INSENSITIVE HIGH EXPLOSIVES (IHE)
R. R. McGuire and R. P. Guarienti *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 501-507 (For primary document see N86-20589 11-31)
(Contract W-7405-eng-48)
(AD-P004841) Avail: NTIS HC A99/MF E03 CSCL 19/4

N86-20611# Department of Defence, Canberra (Australia).
PROPELLANT CATEGORIZATION TRIALS
N. H. Tozer *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 523-538 (For primary document see N86-20589 11-31)
(AD-P004843) Avail: NTIS HC A99/MF E03 CSCL 19/4

N86-20624# Tooele Army Depot, Utah.
DENSITIZATION AND CONVERSION OF AMMONIUM PICRATE (EXPLOSIVE d) TO FUEL
S. S. W. Kwak *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 2 Aug. 1984 p 873-999 (For primary document see N86-20623 11-31)
(AD-P004683) Avail: NTIS HC A99/MF E03 CSCL 13/12

N86-20630# Naval Surface Weapons Center, Silver Spring, Md.
MAXIMUM TNT EQUIVALENCE OF NAVAL PROPELLANTS
M. M. Swisdak, Jr. *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 2 Aug. 1984 p 1383-1393 (For primary document see N86-20623 11-31)
(AD-P004886) Avail: NTIS HC A99/MF E03 CSCL 13/12

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N86-20585# National Bureau of Standards, Washington, D.C.
FIRE BEHAVIOR OF UPHOLSTERED FURNITURE Final Report
Vytenis Babrauskas and John F. Krasny Nov. 1985 104 p refs (NBS/MONO-173; LC-85-600620) Avail: SOD HC as 003-003-02710-3

A systematic review is made of engineering data on the major aspects of upholstered furniture flammability: cigarette ignition, small open flame ignition, radiant ignition, transition from smoldering to flaming, flame spread rates, and heat release and mass loss rates during fully involved burning. Other areas discussed, but for which less data are available, include smoke production and radiant heat fluxes. Mattresses and transportation vehicle seating are included, along with upholstered chairs, loveseats, and sofas. Appropriate test methods most suitable for measuring each of these properties are discussed. Where available, relationships are presented which permit the quantitative prediction of full scale furniture behavior from bench scale tests. Where such relationships

are not available, generalizations of qualitative results of empirical tests are given. Areas where substantive work is not available are outlined. Author

N86-20586*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
GROWTH OF HIGH-QUALITY THIN-FILM Ge SINGLE CRYSTALS BY PLASMA-ENHANCED CHEMICAL VAPOR DEPOSITION
R. A. Outlaw and P. Hopson, Jr. Feb. 1986 15 p refs
(NASA-TP-2532; L-16011; NAS 1.60:2532) Avail: NTIS HC A02/MF A01 CSCL 20B

Thin-film Ge single crystals (approx. 10 microns) have been epitaxially grown on polished NaCl(100) substrates at 450C by using plasma-enhanced chemical vapor deposition. Films on approximately 1 sq cm and larger were separated from the NaCl by either melting the salt or by differential shear stress upon cooling to room temperature. The ordered growth of the Ge was found to be most sensitive to the initial plasma power and to the continuum flow dynamics within the carbon susceptor. The films were visually specular and exhibited a high degree of crysalline order when examined by X-ray diffraction. The films were found to be p-type with a carrier concentration of approximately 3 x 10 to the 16th power/cu cm, a resistivity of 0.11 ohm-cm, and a Hall hole mobility of 1820 sq cm/v/s at room temperature. Vacuum firing minimized the primary contaminant, Na, and corresponding lowered the carrier concentration to 4 x 10 to the 14th power/cu cm. Author

N86-20587*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ION BEAM SPUTTER ETCHING Patent Application
Bruce A. Banks and Sharon K. Rutledge, inventors (to NASA) Filed 13 Sep. 1985 12 p
(NASA-Case-LEW-13899-1; NAS 1.71:LEW-13899-1; US-Patent-Appl-SN-775968) Avail: NTIS HC A02/MF A01 CSCL 13H

An ion beam etching process which forms extremely high aspect ratio surfce microstructures using thin sputter masks is utilized in the fabrication of integrated circuits. A carbon rich sputter mask together with unmasked portions of a substrate is bombarded with inert gas ions while simultaneous carbon deposition occurs. The arrival of the carbon deposit is adjusted to enable the sputter mask to have a near zero or even slightly positive increase in thickness with time while the unmasked portions have a high net sputter etch rate. NASA

N86-20588*# National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE SAFETY ADVISORY PANEL, COVERING CALENDAR YEAR 1985 Annual Report
Jan. 1986 99 p
(NASA-TM-88637; NAS 1.15:88637) Avail: NTIS HC A05/MF A01 CSCL 13B

The level of activity of the Aerospace Safety Advisory Panel was increased somewhat during 1985 in concert with the increased mission rate of the National Space Transportation System, the evolutionary changes in management and operation of that program, and the preparation of the Vandenberg Launch Site; the implementation of the Program Definition Phase of the Space Station Program; and actual flight testing of the X-29 research aircraft. Payload STS missions and NASA's overall aircraft operations were reviewed. The safety aspects of the Leasat salvage mission were assessed. The panel's 1985 work is summarized and its findings enumerated and recommendations for the attention of NASA management presented. NASA's response to the Panel's 1984 report findings and recommendations is appended. Author

N86-20589# Department of Defense Explosives Safety Board, Alexandria, Va.
MINUTES OF THE 21ST EXPLOSIVES SAFETY SEMINAR, VOLUME 1
Aug. 1984 843 p refs Seminar held in Houston, Tex., 28-30 Aug. 1984 2 Vol.
(AD-A152062) Avail: NTIS HC A99/MF E03 CSCL 19/4

Numerous topics related to explosives safety are discussed. Fire fighting and prevention, propellants, shielding, safety systems, transportation electric circuits, and concrete structures are among the subjects discussed. For individual titles, see N86-20590 through N86-20622.

N86-20590# Corps of Engineers, Huntsville, Ala.
DEPARTMENT OF THE ARMY FACILITY SYSTEM SAFETY (FASS) PROGRAM
R. D. Dempsey *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosive Safety Seminar, Volume 1 Aug. 1985 p 33-68 (For primary document see N86-20589 11-31)
(AD-P004821) Avail: NTIS HC A99/MF E03 CSCL 19/4

The Facility System (FASS) program, is designed to apply system safety engineering and management principles to identify hazards and reduce risks associated with new facilities to a level consistent with mission requirements. GRA

N86-20591# Chemical Research and Development Center, Aberdeen Proving Ground, Md.
THE DEVELOPMENT AND IMPLEMENTATION OF FACILITY SYSTEM PROGRAM AT THE CHEMICAL RESEARCH AND DEVELOPMENT CENTER
T. E. Bower, G. E. Collins, and T. S. Kartachak *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 69-84 (For primary document see N86-20589 11-31)
(AD-P004822) Avail: NTIS HC A99/MF E03 CSCL 19/4

A systems approach to hazard identification, elimination and control has historically been applied primarily to the development of equipment. The Safety Office of the Chemical Research and Development Center (CRDC) has reviewed and evaluated the current facility safety posture to determine regulatory complicance and good engineering practices. To augment the effectiveness of facility design construction review, a new systematic approach for early hazard identification, assessment, elimination and control for facilities was developed and implemented to alleviate these shortcomings in the future. GRA

N86-20592# Chemical Research and Development Center, Aberdeen Proving Ground, Md.
SAFETY AND HEALTH CRITERIA FOR THE DESIGN OF A RESEARCH AND DEVELOPMENT FACILITY
G. E. Collins and T. S. Kartachak *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 85-134 (For primary document see N86-20589 11-31)
(AD-P004823) Avail: NTIS HC A99/MF E03 CSCL 19/4

Safety engineering support is provided to a chemical research and development center research and development facility. The criteria was developed during the early stages of the project and represents the minimum requirements tailored specifically for this facility. GRA

N86-20593# Prins Maurits Lab. TNO, Rijswijk (Netherlands).
WINDOW PANES LOADED BY EXPLOSIONS
A. Harmanny, W. Karthaus, and G. Opschoor *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 135-149 (For primary document see N86-20589 11-31)
(AD-P004824) Avail: NTIS HC A99/MF E03 CSCL 19/4

It is possible to calculate the maximum stresses in blast-loaded, rectangular window-panes, with the help of the stresses in the corner of a simply supported plate under pure bending. A value for the strength of glass has been established that may be adjusted for changes in pane area and thickness. GRA

N86-20594# Naval Civil Engineering Lab., Port Hueneme, Calif.
DESIGN CRITERIA AND PRELIMINARY ACCEPTANCE TEST SPECIFICATIONS FOR BLAST RESISTANT WINDOWS c39

G. E. Meyers *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 153-214 (For primary document see N86-20589 11-31)
(AD-P004825) Avail: NTIS HC A99/MF E03 CSCL 19/4

Preliminary design criteria for blast resistant windows exposed to blast overpressures up to 25 psi are recommended. Design procedures and design curves for fully tempered glass are presented and parametized according to glass thickness, glass dimensions, glass aspect ratio, peak blast overpressures, and effective blast duration. Curves for annealed glass are also presented for the purpose of analyzing the safety of existing structures. Design criteria for frames and a test certification procedure are also discussed. Additionally, design examples are presented. GRA

N86-20595# IIT Research Inst., Annapolis, Md.
VEHICLE OVERTURNING VULNERABILITY FROM AIR BLAST LOADS
R. R. Robinson, H. Napadensky, and A. Longinow *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 215-224 (For primary document see N86-20589 11-31)
(AD-P004826) Avail: NTIS HC A99/MF E03 CSCL 19/4

The overturning response of an armored personnel carrier to air blast loads derived from a nuclear blast environment is presented. The orientation of the vehicle is side-on to the air blast shock front. It is assumed there is no translation at the downwind wheels, i.e., the roll over point. In addition, the vehicle is assumed to behave as a rigid body. That is, the suspension system are taken as rigid, so that the wheels and axles rotate in unison with the body. It can be shown that this assumption slightly overestimates the overturning resistance of vehicles with suspension systems. For a stiff suspension system, such as that of the APC, the rigid body behavior assumption is justified. The only motion possible for this analysis is rotation about the rollover point. The effect of overturning restraint systems has been included in the analysis by incorporating a perfectly plastic vehicle to ground connection on the upwind side of the vehicle. The results give the threshold nuclear environment that just causes overturning. The threshold environment is given in terms of a peak overpressure corresponding to a weapon yield. Results are presented for a range of weapon yields from 1KT to 1MT. GRA

N86-20596# Messerschmitt-Boelkow G.m.b.H., Munich (West Germany).
SENSITIVITY OF HIGH EXPLOSIVES AGAINST HOT FRAGMENTS **c28**
M. Held and T. K. Rosendorfer *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 225-248 (For primary document see N86-20589 11-31)
(AD-P004827) Avail: NTIS HC A99/MF E03 CSCL 19/4

A procedure has been developed for testing the reaction of high explosive to the heat of hot fragments. Fragments are heated up to 1000 C and injected into HE and the reaction noted. The most surprising result was that, at all tests performed on this device with steel spheres of 10 and 20 mm diameter even up to temperatures of 1000 C, neither a fast reaction nor deflagration, nor even a detonation occurred. GRA

N86-20597# Aerojet Tactical Systems, Sacramento, Calif.
ATEX: A CASTABLE INSENSITIVE HIGH EXPLOSIVE **c28**
J. W. Barry and G. A. Zimmerman *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 249-258 (For primary document see N86-20589 11-31)
(AD-P004828) Avail: NTIS HC A99/MF E03 CSCL 19/4

A new castable IHE explosive, ATEX, developed by the Aeroject Tactical Systems Co. is described. The interim qualification testing conducted successfully according to NAVord OD44811 is reviewed and the processing characteristics and physical properties of the explosives are discussed. ATEX was the first composition to be tested to the new IHE standards established by the DOD Ammunition and Explosives Safety Standards, DOD 5154.45, Interim Change 4. GRA

N86-20598# Societe Nationale des Poudres et Explosifs, Vert-Le-Petit (France).
METHOD OF PREDICTION OF THE EXPLOSIVE BEHAVIOR OF HIGHLY CONFINED PBXS SUBMITTED TO BULLET IMPACT **c28**
P. Monteagudo *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 259-283 (For primary document see N86-20589 11-31)
(AD-P004829) Avail: NTIS HC A99/MF E03 CSCL 19/4

The mechanisms which govern the bullet impact reactivity of strongly confined castable plastic bonded high explosives are described. The parameters which drive the reaction are pointed out. This is a deflagration to detonation transition, in the studied cases. A first practical model, able to forecast the explosive behavior of castable plastic bonded high explosives (based on the fragmentability of the explosive material) and strongly confined was elaborated. GRA

N86-20599# Health and Safety Executive, London (England).
THE UNITED NATIONS MANUAL OF TESTS FOR CLASSIFICATION OF EXPLOSIVES **c28**
R. R. Watson *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 285-291 (For primary document see N86-20589 11-31)
(AD-P004830) Avail: NTIS HC A99/MF E03 CSCL 19/4

The United Nations Committee of Experts on the Transport of Dangerous Goods has prescribed a regime of test methods in chapter 4 of its recommendations on the transport of dangerous goods, commonly known as The Orange Book. The UN Group of Experts on Explosives has just completed a manual of tests which will enable national competent authorities to harmonize their techniques and criteria for acceptance of explosives into Class 1 and the assignment of explosives to appropriate hazard divisions, thereby promoting the international recognition of one another's classifications. The test manual is in broad terms. The difficulties in harmonizing test methods and the future program of work by the UN in this field are discussed. GRA

N86-20600# Health and Safety Executive, London (England).
CLASSIFICATION REQUIREMENTS FOR THE IMPORTATION OF EXPLOSIVES INTO THE UNITED KINGDOM **c28**
A. R. Duckworth *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 293-302 (For primary document see N86-20589 11-31)
(AD-P004831) Avail: NTIS HC A99/MF E03 CSCL 19/4

The UK position on the classification of commercial explosives is presented. some of the problems encountered are described. An approach is proposed for the international acceptance of explosives classified in other countries which the UK has recently adopted. The term commercial explosives refers to all types other than military explosives under the control of the Ministry of Defence. GRA

N86-20601# Royal Armament Research and Development Establishment, Fort Halstead (England).
CLASSIFICATION OF ENERGETIC MATERIALS FOR TRANSPORT
J. F. Bassett and J. Connor *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 303-311 (For primary document see N86-20589 11-31)
(AD-P004832) Avail: NTIS HC A99/MF E03 CSCL 19/4

The United Nations recommendations on the Transport of Dangerous Goods give guidelines for the procedures to be followed in order to determine whether materials should be classified as explosives and, if they should, to which hazard division they should be assigned. Studies of two materials, a demolition explosive and an energetic plasticiser, designed to determine their hazard classifications are detailed. Comments are made on the UN scheme

and on its interpretation. K10 liquid should be removed from the UN explosives class since test results demonstrate such a classification to be unrealistically severe. Under the present UN scheme, PE4 is correctly assigned to HD1.1D. However, PE4 is a low sensitiveness, low explosiveness material and this assignment is believed to be unnecessarily severe. The choice of ignition or initiation stimulus in the package and stack stages of UN Series 6 should be based on a test of the product employing a severe mechanical shock such as bullet impact rather than on the proposed end use of the product. GRA

N86-20602# Ministry of Defence, London (England).
CLASSIFICATION OF EXPLOSIVES IN ACCORDANCE WITH INTERNATIONAL SYSTEM **c28**
W. S. N. Tinkler *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 313-323 (For primary document see N86-20589 11-31)
(AD-P004833) Avail: NTIS HC A99/MF E03 CSCL 19/4

Principles for deciding the hazard division classification; the compatibility group classification; Classification codes; and the interaction of hazard division, compatibility group, and quantity of explosives are discussed. GRA

N86-20603# Army Materiel Command, Aberdeen Proving Ground, Md.
REFLECTED OVERPRESSURE IMPULSE ON A FINITE STRUCTURE **c39**
G. A. Coulter and C. N. Kingery *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 325-364 (For primary document see N86-20589 11-31)
(AD-P004834) Avail: NTIS HC A99/MF E03 CSCL 19/4

The effect of angle of incidence of the shock front on reflected impulse loading on a finite structure is discussed. Impulse reflection factors have been developed for angles of incidence from zero to ninety degrees. Reflected impulse on a finite structure is much less than reflected impulse on an infinite plane because of the unloading due to rarefaction waves propagating from the sides of the structure which lowers the reflected overpressure. GRA

N86-20604# Naval Civil Engineering Lab., Port Hueneme, Calif.
EFFECT OF FRANGIBLE PANELS ON INTERNAL GAS PRESSURES **c34**
J. E. Tancreto and E. S. Helseth *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 365-394 (For primary document see N86-20589 11-31)
(AD-P004835) Avail: NTIS HC A99/MF E03 CSCL 19/4

A frangible panel in a structure is an exterior surface designed to break lose and blow away quickly enough to limit effects from an explosion inside the structure. Typical frangible panels are lightweight, compared to the surfaces of the structure. Panel connections are designed to offer little resistance in any surfae of the structure. Frangible panels are primarily to limit the internal blast environment, reduce the debris hazard to personnel and property outside the structure, and vent effects of explosions inside hardened structures in prescribed directions away from the structure. An ideal frangible panel is one that does not increase the internal blast environment. This requires a massless panel that is a nonreflecting surface for shock waves. Since any panel will have mass, frangible panels must be designed on a case-by-case basis and their effects on the internal blast environment accounted for in the design of the structure. Topics discussed include gas pressure loading, design loading, and equivalent weight of TNT. GRA

N86-20605# Southwest Research Inst., San Antonio, Tex.
EFFECTS OF COMBUSTIBLES ON INTERNAL QUASI-STATIC LOADS **c39**
N. R. Sandoval, J. C. Hokanson, E. D. Esparza, and W. E. Baker *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 395-415 (For primary document see N86-20589 11-31)
(AD-P004836) Avail: NTIS HC A99/MF E03 CSCL 19/4

The phenomenon of quasi-static pressure enhancement produced when combustible materials are placed near high explosive (HE) source has been recently discovered. The effects of placing solid and liquid combustible materials near detonating explosives on internal blast loading was measured during tests conducted in a one-eighth scale model of a containment structure. In many cases, dramatic increases in gas pressures resulted. Principal conclusions of this study are: combustible materials near explosives can markedly increase gas pressures in enclosed structures; there is a lack of data on HE-combustible combinations; quasi-static loading calculations should include estimates of contributions from the burning of combustible materials whenever such materials are expected to be in intimate contact with HE sources; and effects of combustibles should be investigated further to determine methods for prediction. Variations in charge to combustible mass, charge type, structure volume, degree of venting and degree of contact between HE and combustible should be studied. GRA

N86-20606# Army Materiel Command, Aberdeen Proving Ground, Md.
BLAST LOADING ON ABOVE GROUND BARRICADED MUNITION STORAGE MAGAZINES **c39**
G. Bulmash and C. N. Kingery *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 417-464 (For primary document see N86-20589 11-31)
(AD-P004837) Avail: NTIS HC A99/MF E03 CSCL 19/4

A NATO munitions storage facility at Machrihanish, Scotland has armaments stored in aboveground magazines. The magazines are surrouned of 3 sides by earth berms. A mass explosion is simulated in a 1/23.5 scale model of this facility using a 1 kg bare hemispherical Pentolite charge to model the full scale mixed explosive load. The charge is detonated with a responding concrete donor structure, and measurements are obtained from pressure sensitive transducers mounted in a neighboring nonresponding steel model. Visual evidence of the blast loading is obtained from a responding concrete acceptor structure. All models are surrounded on 3 sides by coarse sand berms or hardpacked soil berms. It was determined that sand berms attenuate the blast pressure more than hardpacked berms. The confining effects of the donor structure significantly reduced the blast pressure. Positive phase impulse was not significantly reduced by altering the berm material or confining the charge. GRA

N86-20607# Tooele Army Depot, Utah.
SHIELD/BARRICADE TESTING AT AED (AMMUNITION EQUIPMENT DIRECTORATE) **c39**
J. R. Miller *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 465-469 (For primary document see N86-20589 11-31)
(AD-P004838) Avail: NTIS HC A99/MF E03 CSCL 19/4

The shield/barricade testing performed at the Ammunition Equipment Direcorate, Tooele Army Depot, Tooele, Utah, has been invaluable in assessing the protective capability of shields/barricades. Weaknesses, trouble spots, venting problems, and personnel hazards of all kinds have been brought to light during the testing process. Design changes, product and protection improvements have been incorporated in the shields/barricades so that the final tested products can meet MIL-STD 398 requirements. GRA

N86-20608# Morton Thiokol, Marshall, Tex.
ELECTROSTATIC SENSITIVITY OF MAGNESIUM-TEFLON COMPOSITIONS **c24**
H. C. Havron *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 495-500 (For primary document see N86-20589 11-31)
(AD-P004840) Avail: NTIS HC A99/MF E03 CSCL 19/4

Infrared decoy flares are made with a magnesium-Teflon formulation. Under most circumstances, the composition is reported

to have little or no tendency towards ignition from electrostatic discharge. Recent events at the Longhorn Army Ammunition Plant have changed this perception. Three fires have occurred at the press during removal of the RR-119 pellet from the consolidation die. As a result of analysis consultants, investigations, and test data the most probable cause is due to ignition by electrostatic discharge. This particular situation was best solved by placing several Simco Co., ionizing air nozzles fore and aft of the pellet as it sits in the raised position. The system was essentially a positive air pressure being maintained at all times. This assures sufficient air velocity to prevent the ingress of gaseous or particular matter around the ionizing electrodes. Since the ionizing air blowers were installed, there has not been a pellet ignition at the press. GRA

N86-20609# Lawrence Livermore National Lab., Calif.
DOE HAZARD CLASSIFICATION FOR INSENSITIVE HIGH EXPLOSIVES (IHE) **c28**
R. R. McGuire and R. P. Guarienti *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 501-507 (For primary document see N86-20589 11-31)
(Contract W-7405-eng-48)
(AD-P004841) Avail: NTIS HC A99/MF E03 CSCL 19/4

The DOE has adopted a hazard classification of IHE and IHE Subassembly based on the premise of no probability of initiation and proposed a test protocol for that classification based on an in depth understanding of the hazards involved and the response of the energetic material to relevant stimuli. GRA

N86-20610# Centre d'Etudes et Recherches des Charbonnages de France, Verneuil-en-Halatte. Lab. des Substances Explosives.
HAZARD ASSESSMENT OF EXPLOSIVE SUBSTANCES
M. Demissy and C. Michot *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 509-521 (For primary document see N86-20589 11-31)
(AD-P004842) Avail: NTIS HC A99/MF E03 CSCL 19/4

Three French test methods for explosive hazards classification are summarized. A reliable shock sensitivity test, a mechanical stimulus sensitivity test, and a test to determine the tendency of a substance to undergo the transition from deflagration to detonation are discussed. GRA

N86-20611# Department of Defence, Canberra (Australia).
PROPELLANT CATEGORIZATION TRIALS **c28**
N. H. Tozer *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 523-538 (For primary document see N86-20589 11-31)
(AD-P004843) Avail: NTIS HC A99/MF E03 CSCL 19/4

The tests conducted showed that medium calibre propellant AR5401, and by analogy small arms propellant AR2201, can be classified as HD 1.3 when transported in M2 cans palletized in an ISO freight container. The tests do not cover the effects of an external detonation as may be experienced in times of hostilies but cover a typical severe practical disaster that may confront the civilian transportation of propellant. Both AR2201 (critical height 13 inches) and AR5401 (critical height 7 inches) exhibited UN HD 1.3 behavior in M2 cans with greater powder column heights. M2 cans have considerably higher venting pressures than the copper lined wooden boxes traditionally used for transport of small web powders. The time which elapsed between fire outbreak and propellant ignition sugests strong possibility for fire control or event minimization by the use of drenches, etc. GRA

N86-20612# Southwest Research Inst., San Antonio, Tex.
BLAST PRESSURE MEASUREMENTS FOR THE FULL-SCALE GRAVEL GERTIE TEST **c35**
E. D. Esparza and W. E. Baker *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 549-580 (For primary document see N86-20589 11-31)
(AD-P004845) Avail: NTIS HC A99/MF E03 CSCL 19/4

The blast and gas pressure data obtained in the full-scale Gravel Gertie test conducted in 1982 have been used by architecture-engineer firms, in conjunction with other data from model experiments, to define the design loads for the new generation of Gravel Gertie and other blast containment facilities. GRA

N86-20613# Prins Maurits Lab. TNO, Rijswijk (Netherlands).
THE FAILURE MODE OF LAYERED CONCRETE CONSTRUCTION DUE TO CONTACT CHARGES **c39**
J. Weerheijm, W. Karthaus, and G. Opschoor *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 581-596 (For primary document see N86-20589 11-31)
(AD-P004846) Avail: NTIS HC A99/MF E03 CSCL 19/4

Conclusions from an experimental and theoretical research program involving a slab with an intermediate layer are given. When the thickness of directly loaded outer slab is smaller than the critical thickness, this slab fails in a critical way. This means that a concentrated loading is created by the stream of particles which are ejected through the hole punched in the directly loaded slab. This concentrated load has a high energy content and dominates the failure process in the other parts of the structure. No geometrical damping occurs in the stream of particles. When the concentrated loading is formed, this loading cannot be distributed economically by increasing the stiffness and strength of the second layer, and the lower slab fails as a result of shearing. GRA

N86-20614# IIT Research Inst., Chicago, Ill.
FAILURE ANALYSIS OF STRUCTURES SUBJECTED TO MULTIPLE BLAST LOADS **c39**
A. Longinow, J. Mohammadi, and H. S. Mapadensky *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 597-604 (For primary document see N86-20589 11-31)
(AD-P004847) Avail: NTIS HC A99/MF E03 CSCL 19/4

The problem of structural response in a multiple load blast environment is examined. Due to the non-deterministic nature of the problem, the method considers the failure probability of the structure after each blast. The structure is modeled as a single degree of freedom system with strength. The method considers uncertainties in both structural and blast load parameters. Load and resistance are assumed to be lognormally distributed. A failure probability is computed after each blast. GRA

N86-20615# Tooele Army Depot, Utah.
RAPID RESPONSE DELUGE SYSTEM
J. R. Mille *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 605-612 (For primary document see N86-20589 11-31)
(AD-P004848) Avail: NTIS HC A99/MF E03 CSCL 19/4

The development of a rapid response deluge system by the Ammunition Equipment Directorate (AED) for use in suppressing propellant fires during demilitarization shows great promise. Prototype systems have been tested and data acquired on their efficiencies. Present system vs previous generations and lessons learned are discussed. GRA

N86-20616# Radford Army Ammunition Plant, Va.
FAST-ACTING SPRINKLER SYSTEM DESIGN CONSIDERATIONS FOR PROPELLANT MANUFACTURE
A. L. Matthews, J. M. Crable, and P. T. Kristoff *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 613-626 (For primary document see N86-20589 11-31)
(AD-P004849) Avail: NTIS HC A99/MF E03 CSCL 19/4

Fast-acting sprinkler systems for detection and suppression of fires in propellant operations, which require activation in the millisecond range in order to be effective, can be easily defeated unless particular attention is paid to design and maintenance details. Of primary consideration are detector selection and placement in processes to minimize the effect of environmental

influences. Also important are nozzle placement, water flow density, water supply pressure, and pattern and sloping of piping. When all of these design criteria are properly implemented, water application can occur within 100 ms of fire detection. GRA

N86-20617# Detector Electronics Corp., Minneapolis, Minn.
RECENT ADVANCES IN HIGH SPEED DETECTION SYSTEMS FOR AMMUNITION PLANTS
K. M. Klapmeier *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 627-644 (For primary document see N86-20589 11-31)
(AD-P004850) Avail: NTIS HC A99/MF E03 CSCL 19/4

The application of UV detection systems in radioactive environments and the application considerations of infrared, and combinations of ultraviolet and infrared are discussed. Recent developments in high speed single frequency infrared detection systems and their applications to munitions processes are also reviewed. GRA

N86-20618# Army Defense Ammunition Center and School, Savanna, Ill.
INTRINSICALLY SAFE ELECTRICAL CIRCUITS: THEIR APPLICATION IN EXPLOSIVE ENVIRONMENTS c33
K. W. Proper *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 645-664 (For primary document see N86-20589 11-31)
(AD-P004851) Avail: NTIS HC A99/MF E03 CSCL 19/4

The successful application of intrinsically safe electrical circuits depends upon a complete understanding of the concept of intrinsically safe and the concept's utilization during design and evaluation. The history of the concept of intrinsically safe and an exploration of what it is are presented. Its application in an explosive environment and employment of the concept during design and evaluation are discussed. GRA

N86-20619# Naval Surface Weapons Center, Dahlgren, Va.
DoD LIGHTNING PROTECTION REQUIREMENTS FOR STRUCTURES HOUSING EXPLOSIVES
M. Guthrie *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 665-673 (For primary document see N86-20589 11-31)
(AD-P004852) Avail: NTIS HC A99/MF E03 CSCL 19/4

The results of the Department of Defense Lightning Protection Working Group's project on DOD lightning protection requirements for structures housing explosives are given. The text of this paper is limited to that of DOD 6055.9-STD, Chapter 7. The requirements of this Standard are often supplemented by additional requirements from each of the services. GRA

N86-20620# Naval Surface Weapons Center, Silver Spring, Md.
REACTION PROPAGATION ALONG AN ENCLOSED CONVEYOR c34
P. J. Peckham and M. M. Swisdak, Jr. *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 789-806 (For primary document see N86-20589 11-31)
(AD-P004858) Avail: NTIS HC A99/MF E03 CSCL 19/4

Tests were conducted to study the likelihood of explosive reaction propagation along an enclosed explosive handling conveyor. An initiation scheme was selected and tests conducted which insured a high order detonation over the entire length of an explosive increment. A full scale mockup of a 125-foot enclosed section of conveyor was constructed. A 50-foot increment of explosive was detonated. A 25-foot air gap and a 50-foot acceptor increment were also present. The acceptor did not detonate, nor even react violently. A small amoung of self-extinguishing burning was also observed. GRA

N86-20621# Air Force Armament Lab., Eglin AFB, Fla.
SUPPRESSION OF SYMPATHETIC DETONATION
J. C. Foster, Jr., M. E. Gunger, B. G. Craig, and G. H. Parsons *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 813-837 (For primary document see N86-20589 11-31)
(AD-P004860) Avail: NTIS HC A99/MF E03 CSCL 19/4

There are two basic approaches to suppression of sympathetic detonation. Minimizing the shock sensitivity of the explosive to long duration pressure will obviously reduce interround separation distances. However, given that the explosive sensitivity is fixed, then much can be gained through the use of simple barriers placed between the rounds. Researchers devised calculational methods for predicting shock transmission; experimental methods have been developed to characterize explosive shock sensitivity and observe the response of acceptors to barriers. It was shown that both EAK and tritonal can be initiated to detonation with relatively low pressure shocks of long durations. It was also shown that to be an effective barrier between the donor and acceptor, the material must attenuate shock and defect fragments. Future actions will concentrate on refining the design of barriers to minimize weight, volume, and cost. GRA

N86-20622# Aerojet Techsystems Co., Sacramento, Calif.
A SYSTEM FOR EXTINGUISHING POL (PETROLEUM, OILS AND LUBRICANTS) AND ORDNANCE TYPE FIRES
W. C. Ostrander *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 839-851 (For primary document see N86-20589 11-31)
(AD-P004861) Avail: NTIS HC A99/MF E03 CSCL 19/4

The capability to control catastrophic fire is now available and application analysis can identify optimum hardware installation. Protection can be by mobile equipment or a fixed installation; the system provides reduced damage, permits earlier facility start-up and return to production/operation and readiness is preserved by minimizing personnel, material, and facility losses. GRA

N86-20623# Department of Defense Explosives Safety Board, Alexandria, Va.
MINUTES OF THE 21ST EXPLOSIVES SAFETY SEMINAR, VOLUME 2
Aug. 1984 839 p refs Seminar held in Houston, Tex., 28-30 Aug. 1984 2 Vol.
(AD-A152150) Avail: NTIS HC A99/MF E03 CSCL 13/12

Several topics related to the safe manufacturing and handling of explosive materials are discussed. Concrete reinforced structures, carbon monoxide poisoning, protective clothing, production engineering, and risk assessment techniques are among the topics covered. For individual titles, see N86-20624 through N86-20638.

N86-20624# Tooele Army Depot, Utah.
DENSITIZATION AND CONVERSION OF AMMONIUM PICRATE (EXPLOSIVE d) TO FUEL c28
S. S. W. Kwak *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 2 Aug. 1984 p 873-999 (For primary document see N86-20623 11-31)
(AD-P004683) Avail: NTIS HC A99/MF E03 CSCL 13/12

Recovery of Explosive D incidental to demilitarization of munitions by a water washout technique planned for use at the western Area Demilitarization Facility (WADF), results in plating of process piping and equipment with explosive crystals as the Explosive D slurry cools. The solidification and plating of process equipment by Explosive D crystals would create serious operational problems and present a hazardous condition during disassembly and repair of equipment. The Ammunition Equipment Directorate (AED) of Tooele Army Depot, was tasked by the U.S. Army Armament, Munitions and Chemical Command (AMCCOM) to develop a process to prevent Explosive D from solidifying and plating onto the surface of process equipment and piping. In addition, the WADF processes would possibly involve the mixing of explosive D with traces of other explosives from previous operations, resulting in a number of associated hazards. GRA

N86-20625# Savanna Army Depot Activity, Ill.
COMPLEXITIES OF LEAD AZIDE c25
W. Shaneyfelt *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosive Safety Seminar, Volume 2 Aug.

1984 p 1143-1148 (For primary document see N86-20623 11-31) (AD-P004872) Avail: NTIS HC A99/MF E01 CSCL 13/12

Lead azide, Pb(N3)2, is an explosive salt of hydrazole acid, HN3, having a molecular weight of 291.258. It is very sensitive to impact, friction, heat, and electrical discharge. Its soluability is less than 1% in cold water and nearly zero in ammonium hydroxide solution, ether, acetone, or ethanol, but it is quite soluable in heated, strongly acid or strongly alkaline solutions. When dry, it does not corrode most metals, however, in the presence of moisture, gold, silver, copper, mercury, tin, and zinc, all form extremely sensitive and dangerous azides. Pure lead azide occurs as colorless needle-like crystals. Breaking these crystals is believed to initiate detonation. Military-use lead azide is white to tan with crystals less than 0.1 mm long to minimize sensitivity. It is approximately 92% pure, having about 4% lead hydroxide (a manufacturing by-product), 3% dextrin (a binder), and 1% trace impurities. Vietnam-era jungle warfare fostered the development of munitions using relatively enormous quantities of load azide. Their sensitivity to detonation caused a reluctance among many users to deploy them, resulting in a stockpile of both munitions and bulk lead azide. The winding down of hostilities left a vast supply and an extremely small demand. Mounting environmental regulations limited most open-air detonations to emergency destruction of immediately hazardous munitions. All munitions were eventually destroyed, leaving the stockpile of bulk lead azide in deteriorating 55-gallon drums. GRA

N86-20626# Naval Civil Engineering Lab., Port Hueneme, Calif.
YIELD-LINE ANALYSIS OF RECTANGULAR LABS WITH DOORS **c39**
P. Wager and S. Berkenbile IN Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 2 Aug. 1984 p 1149-1164 (For primary document see N86-20623 11-31)
(AD-P004783) Avail: NTIS HC A99/MF E01 CSCL 13/12

Several possible yield-line failure mechanisms and the corresponding equations for the ultimate flexural resistance of a slab with a door when subjected to a uniform pressure are presented. The equations are limited to rectangular slabs with openings and are the beginning of an effort of the Naval Civil Engineering Laboratory to develop a comprehensive design procedure for rectangular slabs subjected to blast loads. GRA

N86-20627# Army Armament Research and Development Command, Dover, N. J.
REVISION OF THE DESIGN MANUAL STRUCTURES TO RESIST THE EFFECTS OF ACCIDENTAL EXPLOSIONS (TM 5-1300, NAVFAC P-397, AFM 88-22)
J. Caltagirone, A. Castellano, M. Dede, and N. Dobbs *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 2 Aug. 1984 p 1191-1208 (For primary document see N86-20623 11-31)
(AD-P004875) Avail: NTIS HC A99/MF E01 CSCL 13/12

Procedures for structures designed to resist the effects of a high energy (HE) type explosions are presently available in the Tri-Service Design Manual Structures to Resist the Effects of Accidental Explosions. However, these procedures are limited to reinforced concrete structures. Since its original publication, a considerable amount of data has been generated which brought about the requirement to revise existing procedures in the manual and incorporate new data. The format of the revised manual is described and a discussion on the contents of each of the six volumes, including the improvements made to the existing manual is given. GRA

N86-20628# Army Missile Command, Redstone Arsenal, Ala.
EFFECTS OF CARBON MONOXIDE ON PERSONNEL **c52**
M. Mossa *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 2 Aug. 1984 p 1309-1341 (For primary document see N86-20623 11-31)
(AD-P004882) Avail: NTIS HC A99/MF E03 CSCL 13/12

New weapons and the vehicles on which they mount have and will continue to become increasingly complex. These weapons are potentially more demanding, and challenges need to be addressed. One important challenge is the need to accurately monitor and control the amount of toxic substances, generated by weapon systems, that may endanger the soliders who will operate the systems. Toxic fumes generated from various sources can have debilitating effects on the efficiency of occupants and operators of vehicles and ground equipment. The insidious nature of these effects underscores the necessity for detecting, measuring, and eliminating these hazards to the extent possible. The overall problem that must be addressed is the potential exposure of soldiers to carbon monoxide, ammonia, oxides of sulfur, oxides of nitrogen, lead fumes, and other harmful substances. The exposures are likely to be relatively intense (above present Federal standards for occupational exposure), brief (1 hour or less), and rapidly repeated (as often as six times daily for periods as long as 14 days). Such exposures may occur when soldiers are trained to use various weapon systems or while in combat. GRA

N86-20629# Army Materiel Command, Aberdeen Proving Ground, Md.
AN EXAMINATION OF INJURY CRITERIA FOR POTENTIAL APPLICATION TO EXPLOSIVE SAFETY STUDIES **c52**
D. N. Neades and R. R. Rudolph *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 2 Aug. 1984 p 1343-1354 (For primary document see N86-20623 11-31)
(AD-P004883) Avail: NTIS HC A99/MF E03 CSCL 13/12

A state-of-the-art assessment of research into and the modeling of wounding mechanisms and phenomena is described. The results of an extensive survey of the literature are presented along with recommendations for replacement of the presently used 58 ft-lb rule. The data and models located have been evaluated with respect to applicability to explosive safety studies which typically require quantification of the fragment impact hazards to personnel. Major topics for discussion include penetrating and nonpenetrating injury mechanisms and models, wounding thresholds, military incapacitation criteria, and existing safety criteria, as well as recommendations for formulation of new criteria. Author (GRA)

N86-20630# Naval Surface Weapons Center, Silver Spring, Md.
MAXIMUM TNT EQUIVALENCE OF NAVAL PROPELLANTS **c28**
M. M. Swisdak, Jr. *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 2 Aug. 1984 p 1383-1393 (For primary document see N86-20623 11-31)
(AD-P004886) Avail: NTIS HC A99/MF E03 CSCL 13/12

As part of the Naval Explosives Safety Improvement Program (NESIP), two series of tests have been conducted to determine the maximum TNT equivalence of Naval propellants. Airblast and detonation velocity measurements were made on M26 and NACO 5-inch propelling charges, MK 10 (3.25 in.), MK 16 (5 in.), MK 40 (2.75 in.), MK 58 (Sparrow), MK 37 (Asroc), MK 27 (Tartar), MK 30 (Standard) rocket motors, and TNT cylinders. The MK 40 and MK 37 motors detonated high order and had a TNT equivalence of 70 to 75%. The other applications had TNT equivalencies ranging from 5 to 50%. Recommendations are also made about possible revisions to OP-5. Instead of the 25 percent equivalency now used for guided missile propellants, 100 percent is recommended for double base and composite/double base materials, 50 percent for composite materials, and 125 percent for high energy propellants. Author (GRA)

N86-20631# Mound Lab., Miamisburg, Ohio.
EXPLOSIVE SAFETY CRITERIA AT A DEPARTMENT OF ENERGY CONTRACTOR FACILITY
F. Krach *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 2 Aug. 1984 p 1421-1443 (For primary document see N86-20623 11-31)
(Contract DE-AC04-76DP-00053)
(AD-P004889) Avail: NTIS HC A99/MF E03 CSCL 13/12

Monsanto Research Corporation (MRC) operates the Mound facility in Miamisburg, Ohio, for the Department of Energy. Small

explosive components are manufactured at MRC, and stringent explosive safety criteria have been developed for their manufacturing. The goals of these standards are to reduce employee injuries and eliminate fenceline impacts resulting from accidental detonations. The manner in which these criteria were developed and what DOD standards were incorporated into MRC's own design criteria are described. These design requirements are applicable to all new construction at MRC. An example of the development of the design of a Component Test Facility is presented to illustrate the application of the criteria. Author (GRA)

N86-20632# Naval Civil Engineering Lab., Port Hueneme, Calif.
PREDICTION OF DEBRIS HAZARDS FROM EXPLOSIONS IN BUILDINGS
L. C. P. Huang *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 2 Aug. 1984 p 1445-1459 (For primary document see N86-20623 11-31)
(AD-P004890) Avail: NTIS HC A99/MF E03 CSCL 13/12

The Multiple Debris Missile Impact Simulation (MUDEMIMP) is a computer program that determines debris hazard by calculating the accumulated number of critical debris missiles at various impact ranges. Critical debris missiles are defined by DDESB as those with terminal kinetic energies greater than or equal to 58 ft-lb. The MUDEMIMP employs a probabilistic approach in solving the multiple debris hazard problem by utilizing Monte Carlo sampling techniques to assess the effects of variations and uncertainties on the debris launch characteristics. The debris missile impact simulation starts by selecting one debris missile from the total debris with Monte-Carlo selected debris launch and flight parameters. Then, the computer calculates the trajectory, impact range and terminal kinetic energy of this particular sample debris missile. This Monte Carlo random sampling process is repeated on the remaining debris missiles until all the debris have been sampled. GRA

N86-20633# Ministry of Defence, London (England).
JOINT AUSTRALIAN/UK STACK FRAGMENTATION TRIALS
F. Bowman, J. Henderson, N. J. M. Rees, and J. Walker *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 2 Aug. 1984 p 1461-1484 (For primary document see N86-20623 11-31)
(AD-P004891) Avail: NTIS HC A99/MF E03 CSCL 13/12

In 1980 ESTC decided to conduct a series of trials to assess the fragment throw from explosives. Because of the restrictive nature of minimum fragment throw criteria and the expense of building traverse, for which little credit was given, approaches were made to Australia resulting in Phase I of the trails which were fired in early 1982. The Phase I trials consisted of open stacks of bombs surrounded on two sides by traverses and a similar situation with the stack inside a building, representative of a typical UK array unit storehouse. After the explosion, fragments and debris were collected, on a sample basis, and these were then computer sorted into a basic weight distribution with distance from the site of the explosion. These results were further refined and are presented in tabular form. A detailed consideration of the fragment distribution with distance has resulted in a proposal to reduce minimum fragment throw criteria in the UK Quality-Distance Tables provided the results are confirmed for smaller quantities of explosives. Further trials have been proposed to consider this and the additional complications of different building structures. Author (GRA)

N86-20634# Basler (Ernst) and Partners, Zurich (Switzerland).
METHODS OF QUANTITATIVE RISK ASSESSMENT: THE CASE OF THE PROPELLANT SUPPLY SYSTEM
H. A. Merz and A. Bienz *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 2 Aug. 1984 p 1485-1505 (For primary document see N86-20623 11-31)
(AD-P004892) Avail: NTIS HC A99/MF E03 CSCL 13/12

As a consequence of the disastrous accident in Lapua (Finland) in 1976, where an explosion in a cartridge loading facility killed 40 and injured more than 70 persons, efforts were undertaken to examine and improve the safety of such installations. An ammunition factory in Switzerland considered the replacement of the manual supply of propellant hoppers by a new pneumatic supply system. This would reduce the maximum quantity of propellant in the hoppers to a level, where an accidental ignition would no longer lead to a detonation, and this would drastically limit the effects on persons. A quantitative risk assessment of the present and the planned supply system demonstrated that, in this particular case, the pneumatic supply system would not reduce the risk enough to justify the related costs. In addition, it could be shown that the safety of the existing system can be improved more effectively by other safety measures at considerably lower costs. Based on this practical example, the advantages of a strictly quantitative risk assessment for the safety planning in explosives factories are demonstrated. The methodological background of a risk assessment and the steps involved in the analysis are summarized. In addition, problems of quantification are discussed. Author (GRA)

N86-20635# IIT Research Inst., Chicago, Ill.
TOTAL SYSTEM HAZARDS ANALYSIS FOR THE WESTERN AREA DEMILITARIZATION FACILITY
R. Pape, K. Mniszewski, and E. Swider *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 2 Aug. 1984 p 1529-1551 (For primary document see N86-20623 11-31)
(AD-P004894) Avail: NTIS HC A99/MF E03 CSCL 13/12

The results of a hazards analysis of the Western Area Demilitarization facility (WADF) at Hawthorne, Nevada are summarized. An overview of the WADF systems, the hazards analysis methodology that was applied, a general discussion of the fault tree analysis results, and a compilation of the conclusions and recommendations for each area of the facility are given. Author (GRA)

N86-20636# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
VELOCITY OF DEBRIS FROM BURSTING EXPLOSIVES STORAGE BUNKERS WITH SOIL OVERBURDEN
E. H. Jager *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 2 Aug. 1984 p 1651-1660 (For primary document see N86-20623 11-31)
(AD-P004899) Avail: NTIS HC A99/MF E03 CSCL 13/12

The velocity and range of roof fragments of an earth covered vented bunker on detonation of a mass of explosive contained therein has been calculated by means of a simple analytical techniques, devised originally for calculating the velocity of fragments from bursting pressurized-gas vessels. A 1/10 scale model experiment gave a result very close to the predicted values. Also, a recent incident with a 200-kg HE charge in a 250 cu m bunker gave evidence that agreed all with the results calculated by both the debris range and the appurtenance range (venting-area-hazard) approaches presented here. Author (GRA)

N86-20637# Department of Defence, Canberra (Australia).
DESTRUCTION OF PROPELLANT MAGAZINE, NOVEMBER 1982
N. H. Tozer *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 2 Aug. 1984 p 1661-1669 (For primary document see N86-20623 11-31)
(AD-P004900) Copyright. Avail: NTIS HC A99/MF E03 CSCL 13/12

Details on the destruction of a propellant magazine are given. The properties of single base propellants are discussed. Although single base propellants have been around for one hundred years, production of this type of propellant in Australia only commenced during World War 2 when appropriate plant and know how were provided under the Lend Lease Scheme. Most of the single base propellants made at Mulwala Explosives Factory have been of the IMR type i.e., single perforated tubular granules with their surface coated with DNT for use in small to medium calibre ammunition. Since production started at Mulwala Explosives

Factory in 1944 some fourteen different versions of style of propellant have been manufactured. Four versions only were made up until 1957 and these were identified with an IMR type number matching the US propellants from which they were copied. New varieties introduced since 1957 have been identified with an AR aeries number commencing with AR2001 - the original Australian 7.62 mm rifle propellant. GRA

N86-20638# Lone Star Army Ammunition Plant, Texarkana, Tex.
EVALUATION OF MATERIALS FOR THERMAL PROTECTION
c54
J. I. Martin *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 2 Aug. 1984 p 1671-1687 (For primary document see N86-20623 11-31)
(AD-P004901) Avail: NTIS HC A99/MF E03 CSCL 13/12

An on-going program to provide improved thermal protection for pyrotechnic operators is described. The critical first step in providing improved personal protection is to insure that the best available materials is used to provide the outer shield. Researchers and manufacturers are continually introducing new materials, but they have not been tested against the special kind of thermal threat presented by pyrotechnics. A method of comparative testing of fabrics and other materials is described, and the results obtained with some of the latest available varieties of fabrics are discussed. Author (GRA)

N86-20639# Army Armament Munitions and Chemical Command, Rock Island, Ill.
MINUTES OF THE RAPID ACTION FIRE PROTECTION SYSTEM SEMINAR
Oct. 1984 172 p Seminar held at Rock Island, Ill., 23-24 Oct. 1984
(AD-A158936; AD-E700019) Avail: NTIS HC A08/MF A01 CSCL 13/12

Individual papers in the minutes deal with the following topics: ultraviolet and infrared fire detectors, reduction of false alarms in industrial flame detection systems, deluge systems, rapid action fire protection at ammunition plants, and hazardous waste generation in fire protection. GRA

N86-20640# Department of the Army, Washington, D. C.
RELATIVE SIZING OF LAYOUT DATA TO COMPENSATE FOR EXPOSURE ERRORS ON OPTICAL LITHOGRAPHY SYSTEMS Patent Application
Pallab K. Chatterjee, inventor (to Army) Filed 28 Nov. 1985 7 p
(AD-D011955; US-Patent-Appl-SN-791970) Avail: NTIS HC A02/MF A01 CSCL 13/8

The processing of advance integrated circuits oftentimes employs the patterning of fine geometries of differing levels. This leads to a non-uniform thickness of photo-resist about the topologies and a built-in defocus for the optical projection lithography used to fabricate the integrated circuit itself. In the processing of these advanced integrated circuits according to the invention, the data is to be laid out with a predetermined reticule sizing based on the topological characteristics then of concern, so as to compensate for the defocussing previously associated with a single layer photo-resist process. Author (GRA)

N86-20641# Factory Mutual Research Corp., Norwood, Mass.
FIRE PROTECTION REVIEW REVISIT NO. 2, SANDIA NATIONAL LABORATORIES, ALBUQUERQUE, NEW MEXICO
P. H. Dobson, J. M. Simmons, and H. H. Wallace Oct. 1985 59 p
(Contract DE-AC01-84PE-17056)
(DE86-001138; DOE/PE-17056/T5) Avail: NTIS HC A04/MF A01

Findings of a fire protection review conducted during July 21 to 25, July 28-August 2, 1985, and August 19-23, 1985, at Sandia National Laboratories, Albuquerque, New Mexico are summarized. The visit included: (1) a tour of the facility, (2) water tests, (3) review of records of testing and inspection of fire protection equipment, and (4) tests of selected fire protection equipment to verify equipment had been properly tested and inspected. DOE

N86-20642# Lawrence Livermore National Lab., Calif.
[THE ENGINEERING RESEARCH PROGRAM'S SEARCH AND SUPPORT OF NEW MECHANICAL-ENGINEERING TECHNOLOGY] Engineering Research Progress Report, Oct. 1984 - Mar. 1985
H. H. Woo, ed., R. M. Denney, ed., R. S. Frost, ed., and M. B. Kamelgarn, ed. Mar. 1985 94 p
(Contract W-7405-eng-48)
(DE86-001558; UCID-19323-85-1) Avail: NTIS HC A05/MF A01

This report summarizes the progress made in the first 6 months of the FY-85 Engineering Research Program in the Mechanical Engineering Department. The program's mission is to seek new knowledge and concepts for mechanical-engineering applications of immediate or potential interest to the Laboratory. During this reporting period the program supported 13 projects. Eleven of the projects enhanced the mechanical engineering technology base in four thrust areas. The thrust areas and their associated projects are: (A) Computer-Aided Engineering (2 projects), (1) - Reacting Gasdynamic Flow Interaction, (2) - Solid Geometric Modeling; (B) Dynamic Systems and Controls (2 projects), (1) - Complex Mode-Shape Criteria, (2) Multivariable Systems Analysis and Design; (C) Fabrication Technology (5 projects), (1) - Chip Science, (2) High-Speed Contour Grinding, (3) Fine Grinding of Glass, (4) Precision Contouring of Brittle Materials, (5) - Topometric Interferometry; and (D) Nondestructive Evaluation (2 projects), (1) - Quantitative Ultrasonic Nondestructive Evaluation, (2) - Radiographic Variables in the Ultra-Low Energy Range. The two remaining projects are devoted to studying an isothermal compressor-heat exchanger, and to developing a methodology for determining the mechanical properties of polymers. DOE

N86-20643# Oak Ridge National Lab., Tenn.
QUENCH ENERGIES OF POTTED MAGNETS, III
L. Dresner 1985 7 p Presented at the Cryogenic Engineering Conference and International Cryogenic Materials Conference, Boston, Mass., 12 Aug. 1985
(Contract DE-AC05-84OR-21400)
(DE85-016962; CONF-850814-19) Avail: NTIS HC A02/MF A01

Several different formulas have been proposed for estimating quench energies of potted magnets. These formulas, although based on plausible approximations, disagree with one another by factors of 2 to 6. By the use of maximum and minimum principles for the heat balance equation, it has been possible to determine whether each estimate is an upper or lower bound and to show that some estimates majorize others. DOE

N86-20644# Pennsylvania State Univ., University Park. Dept. of Mechanical Engineering.
INVESTIGATION OF TURBULENT FIRES ON VERTICAL WALLS: WALL PLUME STRUCTURE
M. C. Lai, S. M. Jeng, and G. M. Faeth Feb. 1985 74 p refs
(Grant NB81-NADA-2044)
(PB86-102233; NBS/GCR-85-486) Avail: NTIS HC A04/MF A01 CSCL 21B

A theoretical and experimental study designed to improve understanding of buoyant fires is described. The main objective is to study turbulent fires long surfaces, however, several noncombusting and combusting flow configurations, which offer opportunities to highlight aspects of this problems under impler circumstances, were considered during the work, e.g., buoyant noncombusting wall plumes, for studies of flow properties; and turbulent round flames, for studies of flame radiation properties. Various phases of the study are reported separately; this report considers results for noncombusting wall plumes. Author (GRA)

N86-20416# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
INTRODUCTION TO CRYOGENIC WIND TUNNELS
M. J. Goodyer *In* AGARD Special Course on Cryogenic Technology for Wind Tunnel Testing Jul. 1985 11 p refs Previously announced in IAA as N86-12238 (For primary document see N86-20415 11-09)
Avail: NTIS HC A18/MF A01

N86-20417*# Applied Cryogenics and Materials Consultants, New Castle, Del.
BASIC CRYOGENICS AND MATERIALS
D. A. Wigley *In* AGARD Special Course on Cryogenic Technology for Wind Tunnel Testing Jul. 1985 18 p refs Previously announced in IAA as N85-32215 Sponsored in part by NASA (For primary document see N86-20415 11-09)
Avail: NTIS HC A18/MF A01 CSCL 13B

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N86-20645 Polytechnic Inst. of New York, Brooklyn.
EQUALIZATION IN DIGITAL SATELLITE COMMUNICATION SYSTEMS USING ROBUST KALMAN FILTERING Ph.D. Thesis
Deepak Malhotra 1985 84 p
Avail: Univ. Microfilms Order No. DA8515858

The problem of digital data transmission over handlimited, nonlinear channels in the presence of intersymbol interference and white Gaussian and/or non-Gaussian noise in the uplink and downlink paths is considered. The satellite transponder is assumed to be of soft-limiting type. A recursive, adaptive, real time equalizer structure employing the standard Kalman filter is developed for bindary-phase-shift-keyed (BPSK) satellite systems. The simulation results obtained using a digital computer point to a superior performance of the Kalman filter type equalizer when compared to the Wiener filter equalizer used in the past. The scheme is then extended to the case of an M = 6 PAM system and a four-phase PSK system for which optimum sampling times are derived. It is observed that in contrast to the BPSK system, in which the probability of error decreases exponentially with increasing signal-to-noise ratio, in the the M = 6 PAM system and the four-phase PSK system the probability of error decreases linearly with increasing SNR. Dissert. Abstr.

N86-20646# Louisiana State Univ., Baton Rouge.
PHASE-SENSITIVE DETECTION AND THE BACK-ACTION EVASION OF AMPLIFIER FORCE NOISE Ph.D. Thesis
Gary W. Spetz 1985 191 p
Avail: Univ. Microfilms Order No. DA8517758

Limitations on the sensitivity for detecting a weak classical force acting on a harmonic oscillator are imposed by the quantum mechanical properties associated with a standard amplitude-and-phase measurement and, classically, by the back reaction noise associated with the finite noise temperature of the amplifier used to process the measurement. These are known as the standard quantum limit and the standard amplifier limit, respectively. The theoretical motivation behind the quest to circumvent these limits is presented, and a single-transducer back-action evading measurement scheme designed to perform a phase-sensitive coupling to the oscillator is examined, with the concomitant circumvention of the standard amplifier limit via the squeezing of amplifier back reaction noise. The applicability of squeezing in the detection of gravitational radiation is explored via the dependence of detection sensitivity on the physical temperature and quality factor of the resonant-bar gravitational radiation antenna, on the noise temperature of the amplifier, and on the squeezing factor of the back-action evading measurement; the success of back-action evasion in improving upon the optimum amplitude-and-phase detection sensitivities depends critically upon these parameters. Author

N86-20647* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
WIND DYNAMIC RANGE VIDEO CAMERA Patent
Glenn D. Craig, inventor (to NASA) Issued 8 Oct. 1985 7 p Filed 8 Sep. 1983
(NASA-Case-MFS-25750-1; US-Patent-4,546,248; US-Patent-Appl-SN-530-185; US-Patent-Class-250-225; US-Patent-Class-350-354; US-Patent-Class-358-168) Avail: US Patent and Trademark Office

A television camera apparatus is disclosed in which bright objects are attenuated to fit within the dynamic range of the system, while dim objects are not. The apparatus receives linearly polarized light from an object scene, the light being passed by a beam splitter and focused on the output plane of a liquid crystal light valve. The light valve is oriented such that, with no excitation from the cathode ray tube, all light is rotated 90 deg and focused on the input plane of the video sensor. The light is then converted to an electrical signal, which is amplified and used to excite the CRT. The resulting image is collected and focused by a lens onto the light valve which rotates the polarization vector of the light to an extent proportional to the light intensity from the CRT. The overall effect is to selectively attenuate the image pattern focused on the sensor.
Official Gazette of the U.S. Patent and Trademark Office

N86-20648 British Broadcasting Corp., London (England). Engineering Div.
APLITUDE MODULATION RADIO BROADCASTING: APPLICATION OF COMPANDING TECHNIQUES TO THE RADIATED SIGNAL
W. I. Manson Nov. 1985 23 p refs
(BBC-RD-1985/13) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

A power-saving technique which may be applied to double-sideband amplitude modulation transmitters is described. The technique operates by imposing dynamic compression on the raidated signal, and relies on the action of receiver automatic-gain-control circuits to compensate for this compression at the receiver. It is suggested that use of the proposed technique could result in considerable power saving with minimal effect on the quality of reproduced programs. An extended field trial should be conducted using a representative high-power transmitter, to prove the system fully before an extensive introduction in service is put into effect.
E.A.K.

N86-20649 British Broadcasting Corp., London (England). Engineering Div.
THE PERFORMANCE OF A SATELLITE LINK USING THE BBC TRANSPORTABLE EARTH STATION WITH EBU-LEASED CAPACITY IN THE EUROPEAN COMMUNICATION SATELLITE SYSTEM
C. Gandy Nov. 1985 14 p refs
(BBC-RD-1985/14) Avail: BBC, Kingswood Warren, Tadworth, Surrey, Engl.

A series of tests on a satellite link established between the British Broadcasting Corporation (BBC) Transportable Satellite Earth Station and a BTI fixed earth station using an EBU-leased transponder on the European Communication Satellite (ECS) 2 satellite are described. The transmitted power was limited to comply with new regulations imposed by the satellite operator, but the results indicate that a high quality television link can still be established over a potential coverage area which includes most of Europe. Also, under these conditions an adequate fading margin is obtained for all but 1.75 hours per year. Author

N86-20650 Illinois Univ., Urbana-Champaign.
AN INFORMATION-THEORETIC STUDY OF RATIO-THRESHOLD ANTIJAM TECHNIQUES Ph.D. Thesis
LiFung Chang 1985 114 p
Avail: Univ. Microfilms Order No. DA8521736

The performances of ratio/threshold (R/T) antijam communication systems in the presence of different jamming strategies are studied. Frequency hopping spread spectrum (FH/SS) binary frequency shift keying (FSK) modulation is used for the transmitted signal. Comparisons with a hard decision receiver are made. Channel capacity, cutoff rate and coded bit error probability are used as measures of the performance. A game theoretic problem with two players, transmitter and jammer is formed. The transmitter

can choose either fixed threshold or random threshold as its strategy. The jammer with fixed finite power has either one dimensional jamming or partial band jamming as its strategy. The payoff function of the game is channel capacity or cutoff rate. Using R/T technique, performance considerably superior to that possible with a hard decision receiver vs one dimensional jamming channel or partial band jamming channel can be obtained.
Dissert. Abstr.

N86-20651 Department of the Air Force, Washington, D.C.
SIMULTANEOUS SIGNAL DETECTION FOR IFM (INSTANTANEOUS FREQUENCY MEASUREMENT) RECEIVERS BY TRANSIENT DETECTION Patent
James B. Y. Tsui and Ruby L. Shaw, inventors (to Air Force) Issued 15 Oct. 1985 12 p Supersedes AD-D010496
(AD-D011958; US-Patent-4,547,727; US-Patent-Appl-SN-512064; US-Patent-Class-324-79D) Avail: US Patent and Trademark Office CSCL 17/4

The instantaneous frequency measurement (IFM) receiver is highly susceptible to erroneously reporting frequency if two or more signals are overlapped in time. This problem is extremely important when the receiver is presented to detect simultaneous signals which overlap in the critical frequency encode strobe. In essence, during the pulse overlap condition, a transient will occur on the video output lines of the receiver. These lines are monitored during the transient period and compared with predetermined values which are obtained from a single signal condition. If a transient is detected, a simultaneous signal detect flag is raised and this flag is sent to an associated processor. In this special design, the receiver will measure the frequency again at approximately 200 ms from the first measurement. The transient detection is also performed on the second measurement. GRA

N86-20652*# Notre Dame Univ., Ind. Dept. of Electrical and Computer Engineering.
ERROR CONTROL TECHNIQUES FOR SATELLITE AND SPACE COMMUNICATIONS Final Report, 1 Jul. 1984 - 31 Dec. 1985
Daniel J. Costello, Jr. Mar. 1986 103 p refs
(Grant NAG5-234)
Avail: NTIS HC A06/MF A01 CSCL 17B

The performance of NASA Telecommand System was analyzed. A random coding approach was taken to determine the optimum code rate to use in forward error correcting (FEC) system with a fixed signal energy to noise power density ration, but no bandwidth constraint. Capacity and cutoff rates of concatened coding systems were determined. A lower bound on the minium distance growth rate between unmerged codewords was obtained for time invarient convolutional codes. B.G.

N86-20653# National Aerospace Lab., Tokyo (Japan).
CALIBRATION OF AN ON-GROUND AIRCRAFT TRACKING RADAR BY AERIAL PHOTOGRAMMETRY
Kenji Yazawa, Toshiharu Inagaki, Takatsugu Ono, and Toichi Oka 1985 43 p refs In JAPANESE; ENGLISH summary
(NAL-TR-861; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

An on-ground tracking radar was calibrated for obtaining the accurate position of an aircraft during flight testing. The calibration was performed by aerial photogrammetry for estimating the position and the attitude of an aircraft compared with synchronized data from tracking radar. The accuracy of aerial photogrammetry using a non-metric camera, was less than 0.2% of the flight altitude from ground. The accuracy corresponds to an angle of 0.01 degree at 1000 m height and 10 km distance from the radar. It is comparable to the resolution of the radar. Author

N86-20654# Rome Air Development Center, Griffiss AFB, N.Y.
SIDELOBE SECTOR NULLING WITH MINIMIZED WEIGHT PERTURBATIONS Report, Sep. 1984 - Jan. 1985
R. A. Shore Mar. 1985 23 p Sponsored by AF
(AD-A157057; RADC-TR-85-40) Avail: NTIS HC A02/MF A01 CSCL 20/14

A new method is presented to lower the sidelobes of a given array pattern in a specified sidelobe sector while maintaining the integrity of the original pattern. The method consists of minimizing a performance measure defined to be equal to the weighted sum of the power in the sidelobe sector and the squared eight perturbations. By varying the weights in the performance measure, it is possible to shift the relative emphasis placed on the objectives of lowered sidelobes and small pattern distortion. An analytic solution is obtained and for the perturbed weights that minimize the performance measure, and for the perturbed weights when a constant look direction gain constraint is imposed. Curves are plotted showing pattern parameters and examples of perturbed patterns. Author (GRA)

N86-20655# Electronics Research Lab., Adelaide (Australia).
THE RADAR CROSS SECTION OF PERFECTLY-CONDUCTING RECTANGULAR FLAT PLATES AND RECTANGULAR CYLINDERS: A COMPARISON OF PHYSICAL OPTICS, GTD AND UTD (GEOMETRICAL THEORY OF DIFFRACTION AND THE UNIFORM GEOMETRICAL THEORY OF DIFFRACTION) SOLUTIONS
W. C. Anderson Aug. 1985 95 p
(AD-A161540; ERL-0344-TR) Avail: NTIS HC A05/MF A01 CSCL 17/9

The method of Physical Optics, the Geometrical Theory of Diffraction and the Uniform Geometrical Theory of Diffraction are applied here to electromagnetic scattering from flat plates and rectangular cylinders. The results are compared with experimental measurements to establish the domains of validity of the theoretical techniques. GRA

N86-20656# Royal Australian Navy Research Lab., Edgecliff.
MODELLING THE RADAR EVAPORATIVE DUCT
M. R. Battaglia Apr. 1985 44 p
(AD-A161542; RANRL-TN-3/85) Avail: NTIS HC A03/MF A01 CSCL 20/14

A model of the radar evaporative duct is described, based on Monin-Oburkov similarity theory. The similarity functions, Monin-Oburkov stability length and scaling parameters are derived from experimental data. Graphs are presented for duct heights and the number of trapped modes at 10 GHz for a wide range of environmental conditions. The input to any such theoretical model is information about the vertical rate of change of refractive index in the atmosphere and (in the case of surface-based ducts), and the reflectivity of the rough sea surface. The outputs include refractivity profiles and duct height, and the frequency-dependence of trapping expressed as either the number of trapped modes at a given frequency, or the cut-off frequency. GRA

N86-20657# Defense Communications Engineering Center, Reston, Va.
TWO METHODS OF CONTROLLING POINT-TO-POINT LOSS PROBABILITIES IN A CIRCUIT SWITCHED NETWORK Technical Note Report, 1984 - 1985
Murti Gajjala Sep. 1985 26 p
(AD-A161547; DCEC-TN-1-85) Avail: NTIS HC A03/MF A01 CSCL 17/2

The existing program for the design of OS/AUTOVON networks determines the link sizes for the given network connectivity, traffic loads, routing plan and link blocking probabilities. If the resulting point-to-point loss probabilities are unacceptably high or too low (resulting in large link sizes), the link blocking probabilities need manual adjustment. The desired adjustment is not known and can only be assessed by experimenting with a large number of sets of link blocking probabilities and examining the resultant link sizes and point-to-point loss probabilities. Our search for methods to automatically resize the links using the feedback principle and thereby improve the design of a network led to identification of two methods: (1) Link GOS Adjustment method and (2) Link Size Adjustment method. Test results showed that the first method can effectively bring the point-to-point loss probability of traffic to within the specified GOS with fewer interswitch trunks. The second method maximized the number of source-destination pairs whose point-to-point loss probabilities are

between the specified lower and upper bounds, although it involved more hops for completed calls and more interswitch trunks. GRA

N86-20658# Analytic Sciences Corp., Reading, Mass.
INTEGRATED COMMUNICATION, NAVIGATION, AND IDENTIFICATION AVIONICS: IMPACT ANALYSIS. EXECUTIVE SUMMARY Final Report, Mar. 1982 - Mar. 1984
Michael H. Veatch and James C. McManus Oct. 1985 16 p (Contract F33615-82-C-0002)
(AD-A161799; AFHRL-TP-85-20) Avail: NTIS HC A02/MF A01 CSCL 17/2

This paper summarizes the approach and findings of research into reliability, supportability, and survivability prediction techniques for fault-tolerant avionics systems. Since no technique existed to analyze the fault tolerance of reconfigurable systems, a new method was developed and implemented in the Mission Reliability Model (MIREM). The supportability analysis was completed by using the Simulation of Operational Availability/Readiness (SOAR) model. Both the Computation of Vulnerable Area and Repair Time (COVART) model and FASTGEN, a survivability model, proved valuable for the survivability research. Sample results are presented and several recommendations are also given for each of the three areas investigated under this study: reliability, supportability and survivability. GRA

N86-20659# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Structures Lab.
FORCE-PULSE TESTS OF TACTICAL COMMUNICATION EQUIPMENT Final Report
Roger D. Crowson and Frederick Safford Sep. 1985 232 p
(AD-A162421; WES/TR/SL-85-6) Avail: NTIS HC A11/MF A01 CSCL 14/2

A unique test device as been developed and has been shown to be an effective means of subjecting electronic equipment to biaxial acceleration levels that might be encountered in a battlefield condition. The pulse generator can develop simultaneously a 10,000-lb force vertically and horizontally. Test articles of up to 100 lb have been tested in a rack-mounted system to acceleration levels of 2000 g's. Several mechanical limitations have been identified (i.e., tool chatter) and research has been suggested to broaden the field of application of the pulser. GRA

N86-20660# Fondazione Ugo Bordoni, Rome (Italy).
EXPERIMENTAL EVALUATION OF TWO METHODS TO DETERMINE FORMANT FREQUENCIES USING LINEAR PREDICTION CORRELATION ANALYSIS [VALUTAZIONE SPERIMENTALE DI DUE METODI PER IL TRACCIAMENTO DELLE FREQUENZE FORMANTI BASATI SU ANALISI LPC]
Alessandro Falaschi and Germana Banci Dec. 1984 36 p refs In ITALIAN; ENGLISH summary
(FUB-20-1984) Avail: NTIS HC A03/MF A01

Frequency analysis methods for speech recognition are discussed. One method identifies the physical parameters (poles) of the autoregressive model, while the other uses the spectral estimate obtained by linear prediction analysis. Application examples and graphic representation of the obtained results are presented. Both methods are found equivalent to identify the resonances, but the poles method is easier to handle. The choice of the optimum prediction order remains a problem in both cases. Author (ESA)

N86-20661# Fondazione Ugo Bordoni, Rome (Italy).
OPTIMIZATION CRITERIA FOR MOBILE RADIO SYSTEMS [CRITERI DI OTTIMIZZAZIONE NEI SISTEMI RADIOMOBILI]
Gabriele Falciasecca (Bologna Univ., Italy) Dec. 1984 34 p refs In ITALIAN
(FUB-21-1984) Avail: NTIS HC A03/MF A01

A procedure to optimize mobile radio systems which takes in account user requirements and technical limitations is presented. The factors examined include cost, quality, spectrum utilization, and error probability. The optimization regarding frequency utilization should be considered independent of the cost optimization. The role of research centers in providing up to date information to planning centers is pointed out. Author (ESA)

N86-20662# Fondazione Ugo Bordoni, Rome (Italy).
PROBLEMS RELATED TO ECHO CANCELLATION IN DIGITAL TELEPHONE TRANSMISSIONS [PROBLEMI ATTINENTI ALLA CANCELLAZIONE D'ECO NELLA TRASMISSIONE NUMERICA SU DOPPINO D'UTENTE]
Odoardo Brugia, Salvatore Improta (FATME Spa.), and Romolo Pietroiusti (SIP) Dec. 1984 20 p refs In ITALIAN
(FUB-26-1984) Avail: NTIS HC A02/MF A01

Echo cancellation techniques application to two-wire digital telephone communication is discussed. The model described includes an adaptive transverse filter, a correlation algorithm, and a stochastic iterative algorithm. The criteria for parameter choice are examined. It is shown that this choice influences the convergence rate of the algorithm. Author (ESA)

N86-20663# Fondazione Ugo Bordoni, Rome (Italy).
ANALYSIS OF SYNTHETIC AND VOICE SIGNALS USING EVOLUTIONARY PARAMETRIC METHODS [ANALISI DI SEGNALI SINTETICI E VOCALI MEDIANTE METODI PARAMETRICI EVOLUTIVI]
Giuseppe Martinelli (Rome Univ., Italy), Gianni Orlandi (Rome Univ., Italy), and Lucio PrinaRicotti Dec. 1984 21 p refs In ITALIAN
(FUB-28-1984) Avail: NTIS HC A02/MF A01

Unsteady autoregressive models are discussed. The coefficients of the model may evolve with time following a law described by a linear combination of an orthogonal function set. Using the least squares method, the coefficients of the linear combination of the temporal functions can be obtained by solving a linear equation system. Parameter estimation is similar to the steady autoregressive case, but for the same regression order the number of parameters is multiplied by the number of temporal functions. An implementation of the evolutionary parametric method is applied to voice signals and synthetic signals. The examples show the advantages of the method. Author (ESA)

N86-20664# Institute for Telecommunication Sciences, Boulder, Colo.
LOCAL NETWORK ASSESSMENT
D. V. Glen Apr. 1985 135 p Sponsored by Army
(PB85-217883; NTIA-85/174) Avail: NTIS HC A07/MF A01 CSCL 17B

Local networks, related standards activities of the Institute of Electrical and Electronics Engineers the American National Standards Institute and other elements are presented. These elements include: (1) technology choices such as topology, transmission media, and access protocols; (2) descriptions of standards for the 802 local area networks (LAN's); high speed local networks (HSLN's) and military specification local networks; and (3) intra- and internetworking using bridges and gateways with protocols Interconnection (OSI) reference model. The convergence of LAN/PBX technology is also described. GRA

N86-20665# Joint Publications Research Service, Arlington, Va.
EAST EUROPE REPORT
24 Jan. 1986 146 p refs Transl. into ENGLISH from various East European articles
(JPRS-EER-86-010) Avail: NTIS HC A07/MF A01

Progress in the strategical, local and international relations, and international dissemination by East European countries is reported. Topics discussed include: agriculture, economy, military technology, policies, and developments in science and technology. For individual titles, see N86-20666 through N86-20666.

N86-20666# Joint Publications Research Service, Arlington, Va.
DIGITAL PROCESSING OF RADAR SIGNALS DETAILED
J. Schuster and R. Roemer *In its* East Europe Report (JPRS-EER-860010) 24 Jan. 1986 p 129-141 refs Transl. into ENGLISH from Militaertechnik (East Berlin, East Germany), no. 4, 1985 p 190-193 (For primary document see N86-20665 11-32)
Avail: NTIS HC A07/MF A01

The development of the digital signal processing technology is discussed. Radar signal processing in particular has taken advantage of the procedure and achieved greater dynamic ranges, possibilities of more accurate adjustement of processing parameters to the transmission characteristics of the radar instruments and a higher degree of stability in the parameters than would have been possible with analog technology. The advantages of digital processing are enumerated, they include great accuracy and reproducibility, high reliability, small size and weight, and decreased energy requirements. E.A.K.

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N86-20667 Vermont Univ., Burlington.
BASE AND COLLECTOR CURRENT MECHANISMS IN BIPOLAR NPN GALLIUM ALUMINUM ARSENIDE/GALLIUM ARSENIDE HETEROJUNCTION TRANSISTORS Ph.D. Thesis
Robert Joseph Ferro 1985 91 p
Avail: Univ. Microfilms Order No. DA8517451

Described is an experimental study of the components that are found in the base and collector currents of bipolar Ga sub 1-y Al sub y As(N)-GaAs(PN) heterojunction transistors that are made with liquid phase epitaxy (LPE). The subscript y in Ga sub 1-y Al sub y As denotes the aluminum mole fraction in the emitter material. Reviews of the theories of current flow by diffusion and drift, recombination through band-gap states in the depletion regions and at the interface, tunneling, and tunneling-recombination involving band gap states are first presented. The experimental dependence of base and collector current on base-emitter voltage V sub BE and temperature are used to identify the nature of the current flow in five LPE heterotransistors built with different doping levels, emitter aluminum concentrations, and degrees of graduality in the heterojunction. A relationship is found between the natures of the base and collector currents and both are discovered to be strongly dependent on the graduality of the heterojunction. Author

N86-20668* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AUTOMATIC OSCILLATOR FREQUENCY CONTROL SYSTEM Patent
Stephen F. Smith, inventor (to NASA) (Smith (Stephen F.), Knoxville, Tenn.) Issued 29 Oct. 1985 15 p Filed 6 Sep. 1983 Sponsored by NASA
(NASA-Case-GSC-12804-1; US-Patent-4,550,292;
US-Patent-Appl-SN-529803; US-Patent-Class-331-2;
US-Patent-Class-331-1-A) Avail: US Patent and Trademark Office CSCL 09C

A frequency control system makes an initial correction of the frequency of its own timing circuit after comparison against a frequency of known accuracy and then sequentially checks and corrects the frequencies of several voltage controlled local oscillator circuits. The timing circuit initiates the machine cycles of a central processing unit which applies a frequency index to an input register in a modulo-sum frequency divider stage and enables a multiplexer to clock an accumulator register in the divider stage with a cyclical signal derived from the oscillator circuit being checked. Upon expiration of the interval, the processing unit compares the remainder held as the contents of the accumulator against a stored zero error constant and applies an appropriate correction word to a correction stage to shift the frequency of the oscillator being checked. A signal from the accumulator register may be used to drive a phase plane ROM and, with periodic shifts in the applied frequency index, to provide frequency shift keying of the resultant output signal. Interposition of a phase adder between the accumulator register and phase plane ROM permits phase shift keying of the output signal by periodic variation in the value of a phase index applied to one input of the phase adder.
Official Gazette of the U.S. Patent and Trademark Office

N86-20669* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ROTATABLE ELECTRIC CABLE CONNECTING SYSTEM Patent
David R. Manges, inventor (to NASA) 24 Sep. 1985 9 p Filed 23 May 1984
(NASA-Case-GSC-12899-1; US-Patent-4,542,858;
US-Patent-Appl-SN-613140; US-Patent-Class-242-54-R;
US-Patent-Class-242-107; US-Patent-Class-191-12.2-R) Avail: US Patent and Trademark Office CSCL 09A

A cable reel assembly is described which is particularly adapted for, but not limited to, a system for providing electrical connection of power and data signals between an orbiter vehicle, such as a space shuttle, and a recovered satellite. The assembly is comprised of two mutually opposing ring type structures having 180 deg relative rotation with one of the structures being held in fixed position while the other structure is rotatable. Motor controlled berthing latches and umbilical cable connectors for the satellite are located on the rim of the rotatable ring structure. The electrical cable assembly is fed in two sections from the orbiter vehicle into the outer rim portion of the fixed ring structure where they are directed inwardly and attached to two concentrically coiled metal bands whose respective ends are secured to inner and outer post members of circular sets of guide pins located on opposing circular plate members, one rotatable and one fixed. The cable sections are fed out as three output cable sections through openings in the central portion of the circular plate of the rotatable ring structure where they are directed to the latches and connectors located on its rim.
Official Gazette of the U.S. Patent and Trademark Office

N86-20670* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
AMPLIFIER FOR MEASURING LOW-LEVEL SIGNALS IN THE PRESENCE OF HIGH COMMON MODE VOLTAGE Patent
Fred E. Lukens, inventor (to NASA) (Martin Marietta Corp., Denver, Colo.) Issued 5 Nov. 1985 7 p Filed 7 Aug. 1984 Sponsored by NASA
(NASA-Case-MFS-25868-1; US-Patent-4,551,687;
US-Patent-Appl-SN-638584; US-Patent-Class-330-258;
US-Patent-Class-330-311; US-Patent-Class-330-261) Avail: US Patent and Trademark Office

A high common mode rejection differential amplifier wherein two serially arranged Darlington amplifier stages are employed and any common mode voltage is divided between them by a resistance network. The input to the first Darlington amplifier stage is coupled to a signal input resistor via an amplifier which isolates the input and presents a high impedance across this resistor. The output of the second Darlington stage is transposed in scale via an amplifier stage which has its input a biasing circuit which effects a finite biasing of the two Darlington amplifier stages.
Official Gazette of the U.S. Patent and Trademark Office

N86-20671* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PIEZOELECTRIC DEICING DEVICE Patent
Robert C. Finke and Bruce A. Banks, inventors (to NASA) Issued 8 Oct. 1985 5 p Filed 7 Aug. 1984 Continuation of abandoned US-Patent-Appl-SN-469867, filed 25 Feb. 1983
(NASA-Case-LEW-13773-2; US-Patent-4,545,553;
US-Patent-Appl-SN-638541; US-Patent-Class-244-134-D;
US-Patent-Class-39-25.35; US-Patent-Class-310-324) Avail: US Patent and Trademark Office CSCL 09A

A fast voltage pulse is applied to a transducer which comprises a composite of multiple layers of alternately polarized piezoelectric material. These layers are bonded together and positioned over the curved leading edge of an aircraft wing structure. Each layer

is relatively thin and metallized on both sides. The strain produced in the transducer causes the composite to push forward resulting in detachment and breakup of ice on the leading edge of the aircraft wing.
Official Gazette of the U.S. Patent and Trademark Office

N86-20672* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HYBRID POWER SEMICONDUCTOR Patent
Dan Y. Chen Issued 15 Oct. 1985 5 p Filed 30 Sep. 1983
(NASA-Case-LEW-13922-1; US-Patent-4,547,686;
US-Patent-Appl-SN-537614; US-Patent-Class-307-570;
US-Patent-Class-307-264; US-Patent-Class-307-270;
US-Patent-Class-307-566; US-Patent-Class-307-572) Avail: US Patent and Trademark Office CSCL 09A

The voltage rating of a bipolar transistor may be greatly extended while at the same time reducing its switching time by operating it in conjunction with FETs in a hybrid circuit. One FET is used to drive the bipolar transistor while the other FET is connected in series with the transistor and an inductive load. Both FETs are turned on or off by a single drive signal of load power, the second FET upon ceasing conductions, rendering one power electrode of the bipolar transistor open. Means are provided to dissipate currents which flow after the bipolar transistor is rendered nonconducting.
Official Gazette of the U.S. Patent and Trademark Office

N86-20673*# National Aeronautics and Space Administration. Pasadena Office, Calif.
FERRORESONANT REGULATED POWER SUPPLY Patent Application
W. T. McLyman, inventor (to NASA) (JPL, Pasadena, Calif.) Filed 24 Dec. 1984 12 p
(Contract NAS7-918)
(NASA-Case-NPO-15977-1-CU; NAS 1.71:NPO-15977-1-CU;
US-Patent-Appl-SN-692740) Avail: NTIS HC A02/MF A01 CSCL 10B

A voltage controlled oscillator which drives a switching circuit for dc-to-ac conversion of dc power is presented. The dc-to-ac converter operates into a ferroresonant voltage stabilizer which limits the amplitude of ac voltage that is then rectified and filtered. A sample of the dc voltage output is compared with a reference and fed back as an error signal to alter the frequency of the oscillator, and thus alter the voltage limiting level of the ferroresonant voltage stabilizer as a linear function of frequency for tight control of the output voltage. NASA

N86-20674 Rensselaer Polytechnic Inst., Troy, N.Y.
THEORETICAL STUDY OF SMALL-SIGNAL TRANSPORT AND NOISE IN SEMICONDUCTORS AT HIGH ELECTRIC FIELDS Ph.D. Thesis
Amitava Chatterjee 1985 195 p
Avail: Univ. Microfilms Order No. DA8519485

The advancement of semiconductor technology has progressively reduced the space and time scales for electron motion in modern devices to a point where a basic understanding of the related physical effects is mandatory for a realistic analysis or simulation of the electrical behavior of these devices. Here, the effect of a high electric field on the small signal transport and electrical noise in silicon and gallium arsenide is examined, theoretically, based on the displaced Maxwellian solution to the Boltzmann transport equation. A small signal circuit model is developed for silicon. Nyquist's formula for thermal noise is used to study the effect of electric field on noise power and power pectral density, and to relate the small signal transient and frequency response to the velocity autocovariance function. Thermal and intervalley noise power spectral density and microwave mobility in gallium arsenide are calculated for various field strengths. The observed high frequency limit to negative differential resistance and the maximum in the current noise power spectral density versus electric field curve are explained.
Dissert. Abstr.

N86-20675 Department of the Air Force, Washington, D.C.
PLL SWEPT FREQUENCY GENERATOR WITH PROGRAMMABLE SWEEP RATE Patent
Edwin B. Smith and John R. Fogleboch, Sr., inventors (to Air Force) Issued 8 Oct. 1985 5 p Supersedes AD-D010302
(AD-D011957; US-Patent-4,546,328; US-Patent-Appl-SN-497447;
US-Patent-Class-331-4) Avail: US Patent and Trademark Office CSCL 09/5

This document discusses a phase-locked voltage controlled oscillator for generating frequency modulated waveforms having a programmable digital RF phase shifter to determine the phase difference between the output signal and a phase corrected reference signal to thereby generate the desired output waveform. Author (GRA)

N86-20676 Department of the Air Force, Washington, D.C.
METHOD FOR ASSEMBLING A MULTICONDUCTOR FLAT CABLE Patent
Edward A. Escallier, Stanley R. Dawson, and Joseph M. Shaheen, inventors (to Air Force) Issued 22 Oct. 1985 7 p Supersedes AD-D009632
(AD-D011962; US-Patent-4,548,661; US-Patent-Appl-SN-375640;
US-Patent-Class-156-52) Avail: US Patent and Trademark Office CSCL 09/1

A multiconductor flat cable incorporates an approximately right angle turn in its conductor runs. The right angle turn is provided by first securing the conductor runs in a desired spacing through a first lamination of insulation cover and base sheets while leaving portions of the conductor runs exposed through a window in the first lamination. The first lamination is then severed at the lateral edges of the window so that an end portion of the first lamination may be moved 90% relative to a remaining body portion thereto. The right angle turn is then secured by forming a second lamination with cover and base layers so as to overlap the first lamination and the turn in the conductor runs. GRA

N86-20677# National Aerospace Lab., Tokyo (Japan).
COVARIANCE SPECIFICATION FOR THE LINEAR TIME-INVARIANT OUTPUT-FEEDBACK CONTROL SYSTEMS USING A KALMAN FILTER
Masahiko Nagayasu 1985 16 p refs In JAPANESE; ENGLISH summary
(NAL-TR-882; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

The covariance specification problem using a Kalman filter for the linear time-invariant output-feedback control system contaminated by observation and system noise is described. The optimal output-feedback control using a Kalman filter with which the stationary state covariance matrix coincides with the prescribed matrix is discussed. The system is disturbed by additive white/color system noise and the output signal is contaminated by white observation noise. Using a Kalman filter, the dynamic output feedback control system was obtained. The covariance specification problem, i.e., to obtain the optimal feedback gains under the requirements of the state covariance coinciding with the prescribed covariance for minimizing the control effort, is solved. The control problem of an aircraft in the atmospheric turbulence is discussed as a numerical example. Author

N86-20678*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DEVELOPMENT OF UHF RADIOMETER
Bruce M. Kendall, Hans-Juergen C. Blume, and Aubrey E. Cross Dec. 1985 58 p refs
(NASA-TP-2504; L-16006; NAS 1.60:2504) Avail: NTIS HC A04/MF A01 CSCL 09A

A wideband multifrequency UHF radiometer was initially developed to operate in the 500 to 710 MHz frequency range for the remote measurement of ocean water salinity. However, radio-frequency interference required a reconfiguration to operate in the single-frequency radio astronomy band of 608 to 614 MHz. Details of the radiometer development and testing are described. Flight testing over variable terrain provided a performance comparison of the UHF radiometer with an L-band radiometer for

remote sensing of geophysical parameters. Although theoretically more sensitive, the UHF radiometer was found to be less desirable in practice than the L-band radiometer. Author

N86-20679*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PROGRAMMABLE ELECTRONIC SYNTHESIZED CAPACITANCE Patent Application
Leonard L. Kleinberg, inventor (to NASA) Filed 15 Jul. 1985 15 p
(NASA-Case-GSC-12961-1; NAS 1.71:GSC-12961-1;
US-Patent-Appl-SN-754707) Avail: NTIS HC A02/MF A01 CSCL 09A

A predetermined and veriable synthesized capacitance which may be incorporated into the resonant portion of an electronic oscillator for the purpose of tuning the oscillator comprises a programmable operational amplifier circuit. The operational amplifier circuit has its output connected to its inverting input, in a follower configuration, by a network which is low impedance at the operational frequency of the circuit. The output of the operational amplifier is also connected to the noninverting input by a capacitor. The noninverting input appears as a synthesized capacitance which may be varied with a variation in gain-bandwidth product of the operational amplifier circuit. The gain-bandwidth product may, in turn, be varied with a variation in input set current with a digital to analog converter whose output is varied with a command word. The output impedance of the circuit may also be varied by the output set current. This circuit may provide very small ranges in oscillator frequency with relatively large control votages unaffected by noise. NASA

N86-20680*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
METHOD AND APPARATUS FOR REBALANCING A REDOX FLOW CELL SYSTEM Patent Application
Randall F. Gahn, inventor (to NASA) Filed 25 Jun. 1985 11 p
(NASA-Case-LEW-14127-1; NAS 1.71:LEW-14127-1;
US-Patent-Appl-SN-748536) Avail: NTIS HC A02/MF A01 CSCL 09A

A rebalance cell is provided for a REDOX electrochemical system of the type with anode and cathode fluids which are aqueous HC1 solutions with two metal species in each. The rebalance cell has a cathode compartment and a chlorine compartment separated by an ion permeable membrane. By applying an electrical potential to the rebalance cell while circulating cathode fluid through the cathode compartment and while circulating an identical fluid through the chlorine compartment, any significant imbalance of the REDOX system is prevented. NASA

N86-20681*# National Aeronautics and Space Administration. Pasadena Office, Calif.
BRUSHLESS DC MOTOR CONTROL SYSTEM RESPONSIVE TO CONTROL SIGNALS GENERATED BY A COMPUTER OR THE LIKE Patent Application
Douglas T. Packard, inventor (to NASA) (JPL, Pasadena, Calif.) Filed 26 Apr. 1985 39 p
(Contract NAS7-100)
(NASA-Case-NPO-16420-1; NAS 1.71:NPO-16420-1;
US-Patent-Appl-SN-727838) Avail: NTIS HC A03/MF A01 CSCL 09A

A control system for a brushless DC motor responsive to digital control signals is disclosed. The motor includes a multiphase wound stator and a permanent magnet rotor. The motor is arranged so that each phase winding, when energized from a DC source, will drive the rotor through a predetermined angular position or step. A commutation signal generator responsive to the shaft position provides a commutation signal for each winding. A programmable control signal generator such as a computer or microprocessor produces individual digital control signals for each phase winding. The control signals and commutation signals associated with each winding are applied to an AND gate for that phase winding. Each gate controls a switch connected in series with the associated phase winding and the DC source so that each phase winding is energized only when the commutation signal and the control signal associated with that phase winding are present. The motor shaft may be advanced one step at a time to a desired position by applying a predetermined number of control signals in the proper sequence to the AND gates and the torque generated by the motor be regulated by applying a separate control signal and each AND gate which is pulse width modulated to control the total time that each switch connects its associated winding to the DC source during each commutation period. NASA

N86-20682*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
FOUR QUADRANT CONTROL CIRCUIT FOR A BRUSHLESS THREE PHASE dc MOTOR Patent Application
Frank Nola, inventor (to NASA) Filed 13 Sep. 1985 30 p
(NASA-Case-MFS-28080-1; NAS 1.71:MFS-28080-1;
US-Patent-Appl-SN-775548) Avail: NTIS HC A03/MF A01 CSCL 09A

A control circuit is provided for a brushless three-phase dc motor which affords four quadrant control a single command. The control circuit probes acceleration of the motor in both clockwise and counterclockwise directions and braking and generation in both clockwise and counterclockwise directions. In addition to turning on individual transistors of the transistor pairs connected to the phase windings of the motor for 120 deg periods while the other transistor of that pair is off, the control circuit also provides, in a further mode of operation, turning the two transistors of each pair on and off alternately at a phase modulation frequency during such a 120 deg period. A feedback signal is derived which is proportional to the motor current and which has a polarity consistent with the command signal, such that negative feedback results. NASA

N86-20683# Maryland Univ., College Park. Dept. of Physics and Astronomy.
ELECTRONIC FEEDBACK CONTROL OF MASS-SPRING SYSTEMS
Q. Kong Sep. 1985 114 p
(Contract DACA72-84-C-0004)
(AD-A160691; ETL-0398) Avail: NTIS HC A06/MF A01 CSCL 20/11

This thesis develops an electronic system for the control of motion of different types of active springs, thus improving the performance of mass-spring systems. A mathematical analysis is carried out for various types of active springs. Also, this thesis discusses future design for improving the performance of these electronic circuits to achieve even better performance of mass-spring systems. Josephson junction, mass-spring system, SQUID amplifier, and Wide-band accelerometers are discussed. GRA

N86-20684# Utah Univ., Salt Lake City. Dept. of Bioengineering.
SUSPENDED GATE FIELD EFFECT TRANSISTOR MODIFIED WITH POLYPYRROLE AS ALCOHOL SENSOR Interim Technical Report
Mira Josowicz and Jiri Janata 31 Oct. 1985 37 p
(Contract N00014-81-K-0664)
(AD-A160988; TR-7) Avail: NTIS HC A03/MF A01 CSCL 09/1

A generic type of new type of solid state gas sensor is described which uses change of electron work function of a chemically sensitive layer in response to interaction with a gas or vapor. It is shown that if this layer is electrochemically deposited polypyrrole the device responds to lower aliphatic alcohols. The new sensor operates at room temperature and has time response in seconds. GRA

N86-20685# Carnegie-Mellon Univ., Pittsburgh, Pa.
A PROGRAM OF RESEARCH ON MICROFABRICATION TECHNIQUES FOR VLSI MAGNETIC DEVICES Final Report, 1 Oct. 1983 - 30 Sep. 1984
Mark H. Kryder, M. Alex, J. Artman, L. Bauer, and R. Campbell Nov. 1984 296 p
(Grant AF-AFOSR-0284-80)

(AD-A161271; AFOSR-85-0900TR) Avail: NTIS HC A13/MF A01 CSCL 09/5

New materials, new fabrication techniques and new device structures for high density magnetic bubble devices were developed. The main focus of the work has been to develop ion implanted contiguous disk devices offering sixteen times the bit density of presently manufactured bubble devices and chip capacities of 64 Mbit. Under this contract the authors developed a computer program for modeling magnetic bubble garnet materials and have applied it to the design of bubble materials having isotropic magnetostriction. They have previously shown that such materials would provide better device operating characteristics. During the past year they also modeled the anisotropic stresses around ion implanted propagation patterns and showed how they produce non-uniform anisotropies due to magnetostrictive effects. GRA

N86-20686# Illinois Univ., Urbana. Coordinated Science Lab.
ANALYSIS OF PULSE PROPAGATION IN COUPLED MICROSTRIP TRANSMISSION LINES
J. E. Schutt-aine and R. Mittra Mar. 1985 74 p
(Contract N00014-84-C-0149)
(AD-A161431; R-1036; UILU-ENG-85-2211) Avail: NTIS HC A04/MF A01 CSCL 09/5

In this report the problem of propagation of high speed pulses is considered. The purpose of this analysis is to investigate effects such as RC delays, reflection cross-coupling or cross talk, etc., in coupled microstrip lines. Two-, three-, and coupled N-line configurations are considered under various conditions of terminations. GRA

N86-20687# Illinois Univ., Urbana. Electromagnetic Communication Lab.
MILLIMETER-WAVE INTEGRATED CIRCUITS Final Report, 15 Mar. 1982 - 20 Aug. 1985
Raj Mittra Oct. 1985 104 p
(Contract DAAG29-82-K-0084)
(AD-A161444; UIEC-85-8; UILU-ENG-85-2568; ARO-18054.16-EL) Avail: NTIS HC A06/MF A01 CSCL 09/5

In this report, a number of topics are considered that concern printed circuits and printed circuit discontinuities. First, propagating and evanescent modes of a shielded microstrip are calculated using the spectral Galerkin technique. The characteristic impedance and field configurations of these modes are also calculated. These modes are then used in a mode matching technique, in order to calculate the scattering from abrupt discontinuities in the microstrip. Results are given for various configurations of single and cascaded discontinuities. Next, the singular interval equation technique is used as an alternative to the spectral Galerkin technique, to calculate modes in a shielded microstrip. These results are compared to those generated by the spectral Galerkin technique. Finally, the coupling between multiple transmission lines is considered by using the coupled-mode theory. Results for the propagation constants of the various modes of propagation, as well as for the transfer of current from one line to the next, are presented. GRA

N86-20688# Technical Univ. of Denmark, Lyngby. Lab. of Applied Mathematical Physics.
NON-LINEAR WAVE PHENOMENA IN JOSEPHSON ELEMENTS FOR SUPERCONDUCTING ELECTRONICS Final Report, Apr. - Jun. 1985
P. L. Christiansen, R. D. Parmentier, and O. Skovgaard Jul. 1985 80 p
(Contract DAJA37-82-C-0057; DA Proj. 1T1-61102-BH-57)
(AD-A161544) Avail: NTIS HC A05/MF A01 CSCL 09/3

The long and intermediate length Josephson tunnel junction oscillator with overlap geometry of linear and circular configuration, is investigated by computational solution of the perturbed sine-Gordon equation model and by experimental measurements. The model predicts the experimental results very well. Line oscillators as well as ring oscillators are treated. For long junctions soliton perturbation methods are developed and turn out to be efficient prediction tools, also providing physical understanding of the dynamics of the oscillator. For intermediate length junctions expansions in terms of linear cavity modes reduce computational costs. The narrow linewidth of the electromagnetic radiation (typically 1 kHz of a line at 10 GHz) is demonstrated experimentally. Corresponding computer simulations requiring a relative accuracy of less than 10 to the -7th power are performed on supercomputer CRAY-1-S. The broadening of linewidth due to external microradiation and internal thermal noise is determined. GRA

N86-20689# Oak Ridge National Lab., Tenn.
MECHANICAL PRETHINNING AND THINNING OF UNIQUE MATERIALS FOR TEM
C. P. Haltom 1985 3 p Presented at the Joint Meeting of the Electron Microscopy Society of America and the Microbeam Analysis Society, Louisville, Ky., 5 Aug. 1985
(Contract DE-AC05-84OR-21400)
(DE85-016598; CONF-850840-15) Avail: NTIS HC A02/MF A01

A mechanical dimpling device and ion milling have been used to prepare transmission electron microscopy (TEM) specimens of Al2O3 spheres overcoated with pyrocarbon and SiC. Tensile specimens of partially stabilized zirconia were also prepared for fracturing in an electron microscopy. DOE

N86-20690# Sandia National Labs., Albuquerque, N. Mex. Power Flow Research Div.
IMPEDANCE EFFECTS ON ANODE FORMATION OF MICROPARTICLES IN AN ELECTRON-BEAM DIODE
Eoin W. Gray and Larry F. Rinehart 1985 5 p refs Conference held at undisclosed location
(Contract DE-AC04-76DP-00789)
(DE85-012862; SAND-84-2513C; CONF-850616-9) Avail: NTIS HC A02/MF A01

Anode interactions in electron-beam diodes cannot be ignored. A second impedance level in a microsecond pulse, electron-beam diode with a carbon cathode was identified. Production of spherical microparticles was also observed. These particles range in size from 0.2 to 60 micron diameter and their dimensions obey the Rossin-Rammler distribution. These particles do not appear to be able to penetrate far enough into the vacuum space to participate in the bipolar flow on a micron time scale. However, they can damage the electron support structures and cause spurious discharges on subsequent operation. Possible formation mechanisms of the spherical particles are presented. E.A.K.

N86-20691# Brookhaven National Lab., Upton, N. Y.
DEVELOPMENT OF SUPERCONDUCTING POWER TRANSMISSION TECHNOLOGY
E. B. Forsyth 1985 42 p
(Contract DE-AC02-76CH-00016)
(DE85-016054; BNL-36743) Avail: NTIS HC A03/MF A01

Superconducting power transmission cables are the latest innovation in a technology which is as old as electric power engineering. Distribution of power by means of wires suspended from poles was tried briefly but the densely populated areas chosen as sites for the early generators soon forced the distribution system underground. Edison's low voltage dc system was a technological dead-end but by 1890 Ferranti had built a 7 mile-long underground cable system which operated at the then unprecedented level of 10,000 V, alternating current. Ferranti was remarkably prescient in his choice of wrapped brown paper for the cable insulation, a material which has continued to be used in this application until the present day. Paper was chosen for the insulation because it gave good operating performance at low cost compared to other insulating materials then available, such as rubber and gutta percha. Economic considerations must be weighed carefully in the design of underground power transmission systems and they have been a compelling factor in the pattern of development from the turn of the century to the advanced superconducting systems under test in the 1980's. DOE

N86-20692# Wisconsin Univ., Madison. Dept. of Nuclear Engineering.
MODELING AMBIPOLAR POTENTIAL FORMATION DUE TO ICRF HEATING EFFECTS ON ELECTRONS
J. W. Johnson, J. D. Callen, and N. Hershkowitz Aug. 1985 24 p
(Contract DE-AC02-80ER-53104)
(DE85-018047; DOE/ER-53104/T4; UWPR-85-4) Avail: NTIS HC A02/MF A01

A mechanism for the potential bump observed near the region of ICRF heating in the endplugs of the Phaedrus tandem mirror experiment is investigated by numerical simulation of electron orbits in a simple mirror geometry. Given initial magnetic and ambipolar potential wells that trap the electrons, the near field parallel electric field E-tilde(sub z)e(sup -i(LC OMEGA)t), which is localized near and due to the ICRF heating, tends to eject electrons from the region where E-tilde (sub z) is nonzero. This depletion of the local electron population causes a local increase in the ambipolar potential. The rate at which the electrons are ejected, (dn/dt), is calculated from the electron orbit computation for a given potential well depth. The rate at which passing particles fill in the potential well can also be calculated. For Phaedrus parameters (n0 approx. = 4.0 x 10 to the 12th power cu cm, T sub e) = 20 eV, E-tilde (sub z) approx. = 1.0 V/cm) the electron pumping rate balances the filling rate at a potential well depth of approximately 40 V, consistent with experimental results. DOE

N86-20693# Utah Univ., Salt Lake City. Earth Sciences Lab.
VERY LOW FREQUENCY MAGNETOTELLURIC AND DIPOLE-DIPOLE RESPONSES OF THREE-DIMENSIONAL THIN-LAYER RESISTIVITY STRUCTURE MODELED USING FINITE ELEMENTS
P. E. Wannamaker Sep. 1985 36 p refs
(Contract DE-AC03-84SF-12196)
(DE86-002011; DOE/SAN-12196/14; ESL-159) Avail: NTIS HC A03/MF A01

An algorithm to simulate the very low frequency magnetotelluric and dipole-dipole responses of three-dimensional thin-layer inhomogeneity has been developed from an existing finite element program used to simulate resistivity/IP signatures of 2-D earth sections. The 3-D body is confined to and extends uniformly across a thin layer overlain by air and underlain by infinite resistivity. Electric fields are obtained through differentiation of piecewise parabolas fit to nodal voltages while magnetic fields arise from integration of the free-space Green's tensor over secondary current perturbations throughout the thin layer. Dipole-dipole apparent resistivities arise through application to nodal voltages of the logarithmic geometric factors appropriate to continuously grounded line sources of current. Checks on accuracy of the simulation utilize analytic solutions, 2-D AC plane-wave results using finite elements, and a surface integral equations technique. DOE

N86-20694# Sandia National Labs., Albuquerque, N. Mex.
STABILITY AND GROWTH OF LENNARD-JONES STRAINED LAYER SUPERLATTICE INTERFACES
B. W. Dodson 1985 5 p Presented at the Materials Research Society Meeting, Boston, Mass., 2 Dec. 1985
(Contract DE-AC04-76DP-00789)
(DE85-012348; SAND-84-1188C; CONF-851217-1) Avail: NTIS HC A02/MF A01

In the context of a model system whose atoms interact via Lennard-Jones (LJ) interatomic potentials, we have studied the stability of an initially perfect strained layer superlattice interface (SLS) and the process of growth of a mismatched layer on a substrate using Monte Carlo techniques. An initially perfect SLS interface is found to be metastable up to 12% mismatch, a much higher value than is found in real SLS systems. In contrast, we find that, within the limitations of the calculations, a perfect SLS interface cannot be grown in an LJ system. The implications of these results for understanding SLS growth processes is discussed. DOE

N86-20695# Los Alamos National Lab., N. Mex.
OBSERVATION OF HIGH-POWER MILLIMETER WAVE EMISSION FROM A VIRTUAL CATHODE
H. A. Davis, R. R. Bartsch, E. G. Sherwood, R. M. Stringfield, and L. E. Thode 1985 10 p Presented at the International Conference on Infrared and Millimeter Waves, Lake Buena Vista, Fla., 8 Dec. 1985
(Contract W-7405-eng-36)
(DE86-000799; LA-UR-85-3452; CONF-851238-1) Avail: NTIS HC A02/MF A01

Intense bursts of mm wave power have been observed in microwave generation experiments with a relativistic electron beam (REB) virtual cathode oscillator. In this device an electron beam is injected into a drift space at a current above the space-charge-limit, and a potential develops downstream which is large enough to reflect electrons back to the source region. Two mechanisms can give rise to microwave oscillations in a virtual cathode device: electrons reflexing between the real and virtual cathodes, and oscillations in the amplitude and position of the virtual cathode. Typically both mechanisms are present, but in the present experiments reflexing has been shown to be dominant. DOE

N86-20696# Oak Ridge National Lab., Tenn.
THEORY OF THE AC RESPONSE OF ROUGH INTERFACES
S. H. Liu, T. Kaplan, and L. J. Gray Sep. 1985 8 p Presented at the 6th International Symposium on fractals in Physics, Trieste, Italy, 9 Jul. 1985
(Contract DE-AC05-84OR-21400)
(DE86-001359; CONF-850797-1) Avail: NTIS HC A02/MF A01

It has been known for six decades that the small signal ac impedance of the interface between a blocking electrode and an aqueous or solid electrolyte frequently contains a constant-phase-angle (CPA) element whose impedance has the frequency dependance according to Z proportional to (j(LC OMEGA))/sup -eta/, where 0 < eta < 1. In recent years it has been shown experimentally that the exponent eta is related to the roughness of the interface, with eta approaching 1 when the interface is made increasingly smooth. We propose that the CPA originates from the fractal geometry of the rough interface, and derive on the basis of a number of models that eta = 3 - d (sub s), where d (sub s) is the fractal dimension of the interface. DOE

N86-20697# Westinghouse Electric Corp., Pittsburgh, Pa. Advanced Systems Technology Div.
STUDY TO ASSESS THE EFFECTS OF ELECTROMAGNETIC PULSE ON ELECTRIC POWER SYSTEMS. PHASE 1: EXECUTIVE SUMMARY
J. R. Legro, N. C. Abi-Samra, J. C. Crouse, A. R. Hileman, V. J. Kruse, E. R. Taylor, Jr., and F. M. Tesche Sep. 1985 50 p
(Contract DE-AC05-84OR-21400)
(DE86-001430; ORNL/Sub-83-43374/1/Vol-1) Avail: NTIS HC A03/MF A01

The high-altitude detonation of a nuclear device over the continental United States can expose electric utility power systems to intense, transient electromagnetic pulses (EMP). In addition to the initial transient fields designated as early-time, high-altitude EMP and intermediate-time, high-altitude EMP, electromagnetic signals are also produced at times from seconds to hundreds of seconds after the burst. Nuclear detonations at or near the Earth's surface can also produce transient EMP. This volume presents an executive summary of the preliminary research effort to investigate the nature and coupling of EMP environments to electric power systems, define the construction of approximate system response models, and document the development of a methodology to assess equipment and system vulnerability. The research to date does not include an attempt to quantify power system performance in EMP environments. This effort has been to define the analytical methods and techniques necessary to conduct such assessments at a later time. DOE

N86-20698# Sandia National Labs., Albuquerque, N. Mex.
PHOTONIC MEASUREMENTS OF MICROWAVE PULSES
W. F. Filter, J. Chang, C. O. Landron, and D. J. Muron 1985

6 p Presented at the SPIE International Technical Symposium on Optical and Electro-Optical Engineers, San Diego, Calif., 18 Aug. 1985
(Contract DE-AC04-76DP-00789)
(DE86-001714; SAND-85-0694C; CONF-850887-40) Avail: NTIS HC A02/MF A01

A photonic free space microwave frequency has been successfully demonstrated at the Sandia High Power Microwave facility. This sensor, which uses the Pockels effect, is a miniature dielectric device that was constructed from electro-optic and fiber-optic components. In this sensor, an incident pulsed microwave electric field modulates a carrier laser beam at the microwave frequency. The depth of modulation is proportional to the field strength. Since the bandwidth of the detected signal exceeds that of conventional transient signal digitizers, a prototype High Speed Multichannel Data Recorder that was developed is used. This instrument employs a high bandwidth streak camera to record the sensor signal in real time, without the need for downmixing. Because it is small and dielectric, the sensor is non-perturbing. Its input and output leads are fiber-optic and therefore immune to electromagnetic interference. Because the sensor is broadband, the pulse can be Fourier transformed to a power spectrum. DOE

N86-20699# Lawrence Livermore National Lab., Calif.
INDUCTIVE VOLTAGE DIVIDER
P. C. Wheeler 23 Aug. 1985 20 p
(Contract W-7405-eng-48)
(DE86-001776; UCID-20521) Avail: NTIS HC A02/MF A01

A new diagnostic for measuring pulsed high voltage is proposed, and its characteristics are discussed. The device consists of a small helical coil having a measurable, relatively constant inductance, L. A nearby probe measured I-dot, the time rate of change of current carried by the coil. The voltage to be measured is then the product L times I-dot. This paper discusses the constraints imposed by time resolution and by the necessity to prevent turn-to-turn flashover. DOE

N86-20700# Massachusetts Inst. of Tech., Cambridge. Lab. for Electromagnetic and Electronic Systems.
VARIABLE-RELUCTANCE MOTOR DRIVES FOR ELECTRIC VEHICLE PROPULSION Ph.D. Thesis Final Report
J. H. Lang and F. J. Vallese 1 May 1985 217 p Sponsored in part by DOE/JPL, Pasadena, Calif.
(Grant NAG3-257; Contract DE-AI01-78CS-54209)
(NASA-CR-176566; JPL-9950-1037; NAS 1.26:176566; DE85-017585; DOE/CS-54209) Avail: NTIS HC A10/MF A01 CSCL 09A

A methodology is presented for the design of a variable reluctance motor drive having high specific torque, power output and efficiency. Models are developed that describe the magnetic terminal relations of the VRM. These models are based on a flux-tube analysis that is motivated by numerically obtained finite-difference magnetic simulations. The result is a model for the flux-linkage/phase-current characteristic of the VRM. Intrinsic to this model is the estimation of maximum and minimum inductance as well the incremental inductance during bulk saturation. Also fundamental is the behavior of the flux linkage during local pole-tip saturation and due to bulk core saturation. The drive-oriented treatment of modelling and design uncovered important design interactions between the VRM, its inverter, and its excitation. The experimental 3.8-kW drive operated as expected, verifying the models and the design optimizations developed for VRM drives. These experimental results were projected to the 60-kW level, indicating that a 60-kW drive could be constructed with a VRM having a mass of approximately 65 kg, and an efficiency in excess of 95% at and below peak power output. DOE

N86-20701# Brookhaven National Lab., Upton, N. Y.
TUNING THE RF CAVITY BY USING A DETUNING LOOP
Y. M. Wang, J. Keane, and K. Batchelor Sep. 1985 8 p
(Contract DE-AC02-76CH-00016)
(DE86-001179; BNL-37082) Avail: NTIS HC A02/MF A01

The tuning of the RF cavity with a coupling loop connected to a variable capacitor or an open or shorted coaxial line is described. Two kinds of equivalent circuits are described and some of the calculations of delta f and Q vs capacitance curves are given. At 52 MHz the maximum practical tuning range is about 100 KHz, if the parameters of tuning circuit are chosen properly so that the Q of the accelerating cavity does not decrease too much. DOE

N86-20702# Kema N.V., Arnhem (Netherlands). Dept. of Physical Research.
EXPERIMENTS ON DIELECTRIC RECOVERY OF SWITCHING ARCS
W. R. Rutgers, A. H. vanderWey, and A. J. vanLoon, ed. 1985 14 p refs
(S/T-Rept-Vol-3-No-3; ISBN-90-353-0027-0; ISSN-0167-8590) Avail: NTIS HC A02/MF A01

An experimental facility to investigate the extinction of switching arcs in various gases was built. The temporal evolution of the arc diameter, density, temperature, and withstand voltage were studied during extinction of high-current arc discharges in argon, nitrogen, air and carbon-dioxide gases. The gas column in the early afterglow during the recovery phase can be described as a variable resistance and later as a dielectric gas. The value of the resistance depends on recombination processes and is mainly determined by gas pressure and gas composition. The breakdown strength in the late afterglow depends on gas-temperature (or neutral density) decay and on the remaining degree of ionization. Author (ESA)

N86-20703# Research Inst. of National Defence, Linkoeping (Sweden).
MICROWAVE TUBES. LITERATURE SURVEY NO. 6 COMPRISING YEAR 1984
Lennart Lundgren Oct. 1985 131 p refs
(FOA-C-30406-E; ISSN-0347-3708) Avail: NTIS HC A07/MF A01; Research Inst. of National Defence KR 50

Literature on conventional microwave tubes including gyrotrons, orotrons and reflex triodes was surveyed. References on free electron masers and other concepts of generating or amplifying microwave power indicate the state of the art and the trends of future development. Technological issues like electron guns, cathodes, and electron beams up to 6W level are also included. Author (ESA)

N86-20704# Joint Publications Research Service, Arlington, Va.
EAST EUROPE REPORT: SCIENCE AND TECHNOLOGY
29 Dec. 1985 55 p refs Transl. into ENGLISH from various East European articles
(JPRS-ESA-85-039) Avail: NTIS HC A04/MF A01

Progress in East European science and technology is reported. Topics discussed include: international cooperation in standardization, technology utilization, computer applacations, industrial development, microelectronics, electrical engineering training, computer aided design and computer assisted education, integrated circuits, and vibration proof devices in the mining industry. For individual titles, see N86-20705 through N86-20705.

N86-20705# Joint Publications Research Service, Arlington, Va.
TRENDS IN MICROELECTRONICS DEVELOPMENT, APPLICATIONS
R. Koestner *In its* East Europe Report: Science and Technology (JPRS-ESA-85-039) 29 Dec. 1985 p 12-30 refs Transl. into ENGLISH from Nachrichtentechnik-Elektronik (East Berlin, East Germany), v. 35, no. 9, Sep. 1985 p 322-327 (For primary document see N86-20704 11-33)
Avail: NTIS HC A04/MF A01

Scientific-technical development is characterized by elaboration and application of new technologies based on the principles of chemistry and physics. The microelectronic technology focuses on the highly efficient production of electronic circuits. Microelectronics makes possible the production of electronic circuits of heretofore unattainable complexity and reliability and at quite favorable costs. The reliability of the microelectronic application with the qualitative changes in the cost/performance ratio stimulates its applications to data processing and industry.

Microelectronic products are characterized by a distant increase in functional value with a simultaneous decline in expense. Integrated circuit (IC) adaptation are manufactured and users are interested in the microelectronics. Author

N86-20618# Army Defense Ammunition Center and School, Savanna, Ill.
INTRINSICALLY SAFE ELECTRICAL CIRCUITS: THEIR APPLICATION IN EXPLOSIVE ENVIRONMENTS
K. W. Proper *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 645-664 (For primary document see N86-20589 11-31) (AD-P004851) Avail: NTIS HC A99/MF E03 CSCL 19/4

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N86-20706 Princeton Univ., N. J.
POINT VORTEX INTERACTIONS Ph.D. Thesis
Ambady Suresh 1985 145 p
Avail: Univ. Microfilms Order No. DA8515880

The dynamics of point vortices with a view towards the onset of chaos in these systems were studied. It was conjectured that for a given geometry and external flow, a chaotic threshold N* exists such that N<N* Quasiperiodic Motion N>N* Chaotic Motion where N is the number of vortices. The conjecture (and the determination of N*) for a few special cases is proven. The existence of Horseshoes in the Poincare map of the perturbed system via Melnikov function technique are shown. Such a chaotic threshold suggests the nonintegrability of the two dimensional Euler Equations, in which the vortex equations are imbedded. It is shown that a vortex moving in a bounded, simply connected region of the plane has precisely one equilibrium point that is elliptic and Liapunov stable. The problem of two vortices inside a circle is solved exactly and the role of Morse theory in estimating special solutions is illustrated. Dissert. Abstr.

N86-20707 Michigan Univ., Ann Arbor.
THERMAL INSTABILITIES IN POROUS MEDIA Ph.D. Thesis
Douglas Wayne Stamps 1985 163 p
Avail: Univ. Microfilms Order No. DA8520991

The permanently unsteady fluctuating natural convective state is described or a fluid which saturates a cube of porous medium with constant temperature top and bottom and insulated vertical sides having an initially linear temperature distribution. Four regimes exist as the Rayleigh number increases. The first regime is the conduction state. The second regime is the steady natural convective state which begins at the Rayleigh number 4 pi(2). The third regime is the permanently unsteady regularly fluctuating convective state which begins at a Rayleigh number between 550 and 600. It is characterized by periodic variations in the Nusselt number with time in which the frequency of the variations increases with increasing Rayleigh numbers. The fourth regime is the permanently unsteady irregularly fluctuating convective state which begins at a Rayleigh number between 625 and 650. It is characterized by random variations in the Nusselt number with time and the range of frequencies increases with increasing Rayleigh numbers. Dissert. Abstr.

N86-20708 Illinois Univ., Urbana-Champaign.
AN EXPERIMENTAL INVESTIGATION OF THE SHOCK WAVE TURBULENT BOUNDARY LAYER INTERACTION Ph.D. Thesis
David William Kuntz 1985 287 p
Avail: Univ. Microfilms Order No. DA8521811

Interaction between a shock wave and a turbulent boundary layer was studied. The boundary layer was formed on the floor of a wind tunnel and compression corner models were used to generate the oblique shock wave. Full range of possible flowfields, including flow with no separation, flow with incipient separation, and flow with a significant amount of separation were generated. Measurement techniques used included Schlieren photography, surface static pressure measurement, surface streak pattern measurement, and laser Doppler velocimetry. The results of the LDV measurements indicated that the boundary layer was significantly altered by the interaction. Several features of the redeveloping flow, including high rates of boundary layer growth, large Reynolds stress values, and large turbulent triple product values, indicated the presence of large scale turbulent structures within the turbulent boundary layers downstream of the shock wave boundary layer interactions. Dissert. Abstr.

N86-20709 Cornell Univ., Ithaca, N.Y.
SECOND-ORDER MODELING OF TURBULENT REACTING FLOWS WITH INTERMITTENCY AND CONDITIONAL AVERAGING Ph.D. Thesis
Jyh-Yuan Chen 1985 201 p
Avail: Univ. Microfilms Order No. DA8516980

A rational approach to incorporate the effects of intermittency into a second-order closure scheme for turbulent thin-shear reacting flows is developed in this study. Equations for the intermittency and conditioned statistics are derived using a conventional averaging with the effects of variable density appearing in a first order expansion form. A second-order closure scheme is presented with an emphasis on the terms resulting from the interactions between conditioned zones. A modified Patankar-Spalding numerical method is developed to give better numerical stability. Both equilibrium and nonequilibrium thermodynamic models are considered with a special interest in the prediction of nitric oxide formation. The approach of using combined variables and a second scalar to describe the effects of nonequilibrium is presented in full detail. Calculations of turbulent thin-shear flows with and without combustion agree fairly well with the data available in the literature. Dissert. Abstr.

N86-20710 Rice Univ., Houston, Tex.
SEQUENTIAL GRADIENT-RESTORATION ALGORTHIM FOR OPTIMAL CONTROL PROBLEMS WITH CONTROL INEQUALITY CONSTRAINTS AND GENERAL BOUNDARY CONDITIONS Ph.D. Thesis
Estelle Mathilda Coker 1985 100 p
Avail: Univ. Microfilms Order No. DA8517188

The problem of minimizing a functional 1 subject to differential constraints, control inequality constraints, and terminal constraints is considered in this thesis. It consists of finding the state x(t), the control u(t), and the parameter pi so that the functional is minimized, while the constraints are satisfied to a predetermined accuracy. A sequential gradient-restoration algorithm is developed. It involves a sequence of two-phase cycles, the gradient phase and the restoration phase. In the gradient phase, the value of the functional is decreased, while avoiding excessive constraint violation; in the restoration phase, the constraint error is decreased, while avoiding excessive change in the value of the functional. The variations delta x(t), delta u(t), delta pi are generated by requiring the first variation of the augmented functional J to be negative during the gradient phase; and by requiring the first variation of the constraint error P to be negative, while imposing a least-square criterion on the variations of the control, the parameter, and the initial state during the restoration phase.
Dissert. Abstr.

N86-20711 Michigan Univ., Ann Arbor.
NUMERICAL SIMULATION OF VISCOELASTIC FLOWS OF POLYMER FLUIDS Ph.D. Thesis
Mark Victor Bower 1985 193 p
Avail: Univ. Microfilms Order No. DA8520874

Numerical techniques for the simulation of two typical viscoelastic flows of polymer fluids are presented. Flow in an orthogonal rheometer, which is a shear dominated, and the flow of a tubular membrane under simultaneous inflation and extension, which is

extension dominated. The BKZ model is used in the simulations. The effect of inertia on the flow in an orthogonal rheometer was determined. The governing equations reduce to a two point boundary value problem in spatial variables. Time effects drop out due to the steady flow. The governing equations are solved using a Runge-Kutta technique with the associated shooting procedure done by Broyden's method. Since the flow in a tubular membrane is unsteady the problem reduces to a system of partial differential-integral equations with two point boundary conditions in the spatial variable. The equations are solved in the spatial variable at each time using an Adams method with the associated shooting problem done by Broyden's method. Dissert. Abstr.

N86-20712 California Inst. of Tech., Pasadena.
LASER DOPPLER VELOCITY AND VORTICITY MEASUREMENTS IN TURBULENT SHEAR LAYERS Ph.D. Thesis
Daniel Bernard Lang 1985 209 p
Avail: Univ. Microfilms Order No. DA8519549

A Laser Doppler velocimeter (LDV) system was developed to measure the instantaneous spanwise vorticity, -omega (sub z), in a turbulent shear layer. It was necessary to design and fabricate the LDV optics and processing electronics, as no commercially available LDV systems met the specifications of measuring the velocity of four closely spaced points to the requisite accuracy. Measurements were also made of the instantaneous u, v, u prime, v prime, and - u prime v prime. The instantaneous vorticity was processed to obtain an estimate of its probability density function, from which the mean and rms values were estimated. It was also possible to separate the irrotational fraction of the flow from the rotational (intermittent) fraction of the flow. The development of the intermittency profiles, based on vorticity, as a function of the downstream distance from the splitter plate was studied. A notable feature is that the vorticity is found to have values opposite the mean sense of rotation, a significant fraction of the time.
Dissert. Abstr.

N86-20713 Minnesota Univ., Minneapolis.
DEVELOPMENT AND EVALUATION OF ITERATIVE AND DIRECT METHODS FOR THE SOLUTION OF THE EQUATIONS GOVERNING RECIRCULATING FLOWS Ph.D. Thesis
Mark Edward Braaten 1985 294 p
Avail: Univ. Microfilms Order No. DA8519309

Existing numerical methods were evaluated for the solution of the equations governing recirculating flows, and to develop new methods that are more reliable, rapidly convergent, and computationally efficient than the existing methods. A number of widely used finite difference methods, including SIMPLE, SIMPLEC, SIMPLEST, and SIMPLER, were carefully examined. These methods solve the flow equations in a decoupled sequential manner using standard iterative solvers. A number of new methods that employ direct sparse matrix techniques to solve the flow equations were developed. Three new direct methods, denoted as UVP, PENALTY, and NR-PENALTY, solve the momentum and continuity equations simultaneously over the full domain. The performance of the various methods was tested on some steady two dimensional recirculating flows, over a range of grid sizes and Reynolds numbers. The direct spares matrix methods were found to be much more rapidly convergent and more computationally efficient than the existing iterative procedures. Dissert. Abstr.

N86-20714 Brown Univ., Providence, R. I.
DIRECT AND INVERSE PROBLEMS IN GAS DYNAMICS Ph.D. Thesis
Prabir Kumar Daripa 1985 105 p
Avail: Univ. Microfilms Order No. DA8519825

Three problems in computational fluid dynamics are considered. Steady, inviscid, irrotational flow of a perfect gas in two dimensions is considered in the tangent gas approximation. A fast and accurate method of solution is proposed and solved numerically. Comparison of tangent gas and exact flows are presented. Tangent gas solutions, when used as the first step in the iterative solution of the exact flowfield, are shown to give substantial reduction in computational time. The inverse problem in the tangent gas approximation is considered. An exact method in this approximation for designing airfoils is presented. A simple numerical algorithm which is fast and accurate is presented. Comparison of designed airfoils using the tangent gas method with exact Euler results is found to be excellent for subcritical and slightly supercritical flows. An exact inverse method for designing airfoils is presented. The inverse problem is formulated in terms of a boundary value problem in speed only and the body angle is computed from the boundary estimate of the normal derivative of speed. Closure constraints are not imposed thus allowing the designed airfoil to be an open body. Dissert. Abstr.

N86-20715 British Library Lending Div., Boston Spa (England).
THE CRITICAL DIMENSIONS OF BODIES IN UNSTEADY THERMAL CONDUCTIVITY PROBLEMS
S. Z. Sapozhnikov and S. L. Krupetskii [1985] 8 p Transl. into ENGLISH from Izvestiya VUZ Chernaya Metallurgiya (USSR), no. 6, 1985 p 123-127
(BLLD-M-36552-Trans-(5828.4)) Avail: British Library Lending Div., Boston Spa, England

The heating of plate, cylindrical and spherical shaped bodies in heat bearing media was considered, arriving at equations for the effectiveness of heating (amounts of heat absorbed). The use of the equations is illustrated by an example of heating quasi-spherical particles of iron powder in a layer of pseudo-liquefied corundum; the particle size with which the heat absorbed is minimum is found. As particle size increases, heating becomes rapidly less effective. The concept of the critical size of a body should be used in selecting the optimum heating conditions. Assimilation of heat is lowest with low values of the Fourier criterion. Author

N86-20716 British Library Lending Div., Boston Spa (England).
RADIATIVE HEAT EXCHANGE IN CYLINDRICAL CAVITY WITH ALLOWANCE FOR HEAT LOSSES THROUGH SIDE WALL
Yu. A. Popov and F. R. Shklyar [1985] 9 p refs
(BLLD-M-36553-Trans-(5828.4)) Avail: British Library Lending Div., Boston Spa, England

The problem of heat exchange in a cylindrical chamber with adiabatic walls and an arbitrary number of screens is examined. A simple algorithm is developed for solving the problem of heat losses from the black isothermal base of a round cylinder to the cold base and to the side walls. Author

N86-20717 Illinois Univ., Chicago.
MIXED CONVECTION AROUND A HORIZONTAL CYLINDER Ph.D. Thesis
Rashid A. Ahmad 1985 155 p
Avail: Univ. Microfilms Order No. DA8511263

An analysis and experimental investigation of combined forced and natural convection (mixed convection) heat transfer from a horizontal cylinder dissipating a uniform heat flux is carried out. The ambient medium is taken to be air with Pr = 0.7. The analysis considered the full Navier-Stokes equations describing a two-dimensional mixed flow. The numerical analysis covered the ranges of Reynolds numbers 1 < or = Re sub D < or = 60 and Grashof numbers 0 < or = Gr sub d < or = 1.6 x 10 to the 4th power. The forced convection results for 1 < or = Re sub d < or = 60 were correlated and compared with theoretical results and with other experimental correlations. The correlation is given by Nu bar sub D sub f = 0.8160 Re sub D sup 0.3939. To conduct experimnets, an open return wind tunnel was designed and fabricated. Although the tunnel is capable of producing a forced flow at any arbitrary direction, only cross-flow geometry was considered. The forced flow was varied from 1.4 m/sec to 8 m/sec. At each flow velocity the surface heat flux was varied to cover a range of Gr sub D*. Author

N86-20718 Department of the Air Force, Washington, D.C.
SONIC FLOW PLATE Patent
Nelson E. Jones, inventor (to Air Force) Issued 15 Oct. 1985 8 p Supersedes AD-D009423
(AD-D011954; US-Patent-4,547,884; US-Patent-Appl-SN-366743;

US-Patent-Class-372-58) Avail: US Patent and Trademark Office CSCL 20/4

This patent discloses a sonic flow plate assembly for controlling the mass flow rate of gases by use of the sonic choking phenomenon. Identical gas flow control plate portions, each containing a plurality of nozzles formed by the smooth internal surface of vertical passageways is in the shape of a hollow inverted truncated cone with bases in communication with hollow cylinders. Each plate portion, including the passageways therein, are molded from a fiberglass composite. The connected plate portions are secured in place by transversely positioned tension rods. GRA

N86-20719 British Aerospace Aircraft Group, Preston (England). Wind-Tunnel Dept.

INVESTIGATION INTO TEST RIG INTERFERENCE ON THE Q66 5-HOLE PROBE CALIBRATIONS USING THE BAe WARTON Mk II PANEL PROGRAM

A. P. Winstanley 1 Jun. 1983 31 p

(BAe-ARG-178) Copyright. Avail: Issuing Activity

A panel program was used to confirm that residual flow angles measured with a set of five hole probes are essentially due to the support assembly. The program detects support induced flow angularity at tips of up to 1 deg at high angles of support attitude. The program predicted upwash and sidewash trends agree with experimental observations, although the panel program underestimates the magnitude of the flow angularities.

Author (ESA)

N86-20720*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

STUDIES OF CONDENSATION EFFECTS ON AIRFOIL TESTING IN THE LANGLEY 0.3-METER TRANSONIC CRYOGENIC TUNNEL

Robert M. Hall Jan. 1986 34 p refs Previously announced in IAA as A85-19603

(NASA-TP-2509; L-16021; NAS 1.60:2509) Avail: NTIS HC A03/MF A01 CSCL 20D

In the context of an overall development of transonic, cryogenic wnd tunnel technology, NASA has been investigating the onset of condensation effects in nitrogen gas. The temperature at which condensation occurs determines the minimum operating temperature (MOT) of cryogenic tunnels. The apparatus and airfoils are discussed, taking into account a description of the 0.3-m Transonic Cryogenic Tunnel (TCT), the drag rake, the airfoils, and the technique used for determining the onset of condensation effects. Attention is also given to the types of nucleation processes, the relative sensitivity of drag rake and surface pressure measurements, correlations between data and theory, the prediction of minimum operating temperatures for the 0.3-m TCT, and MOT's for different tunnels. G.R. (IAA)

N86-20721*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

PUMPED TWO-PHASE HEAT TRANSFER LOOP Patent Application

Fred Edelstein, inventor (to NASA) (Grumman Aerospace Corp., Bethpage, N.Y.) Filed 15 Jul. 1985 16 p Sponsored by NASA (NASA-Case-MSC-20841-1; NAS 1.71:MSC-20841-1;

US-Patent-Appl-SN-755288) Avail: NTIS HC A02/MF A01 CSCL 20D

A pumped loop two-phase heat transfer system is presented. The system operates at a nearly constant temperature throughout, and includes a pluarity of independently operating grooved capillary heat exchanger plates supplied with working fluid through independent flow modulation valves connected to a liquid supply line, a vapor line for collecting vapor from the heat exchangers, a condenser between the vapor and the liquid lines, and a fluid circulating pump between the condenser and the heat exchanges. NASA

N86-20722*# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Abteilung Turbulenzforschung.

SHEAR LAYER EXCITATION, EXPERIMENT VERSUS THEORY

Dietrich W. Bechert and Bernhard Stahl 1984 86 p refs

(Grant NAG3-198)

(NASA-CR-176604; NAS 1.26:176604; DFVLR-FB-84-26) Avail: NTIS HC A05/MF A01

The acoustical excitation of shear layers is investigated. Acoustical excitation causes the so-called orderly structures in shear layers and jets. Also, the deviations in the spreading rate between different shear layer experiments are due to the same excitation mechanism. Measurements in the linear interaction region close to the edge from which the shear layer is shed are examined. Two sets of experiments (Houston 1981 and Berlin 1983/84) are discussed. The measurements were carried out with shear layers in air using hot wire anemometers and microphones. The agreement between these measurements and the theory is good. Even details of the fluctuating flow field correspond to theoretical predictions, such as the local occurrence of negative phase speeds. Author

N86-20723# National Aeronautical Lab., Bangalore (India). Fluid Mechanics Div.

A NOTE ON A CLASS OF EXACT SOLUTIONS IN INVISCID ROTATIONAL FLOWS

P. N. Shankar May 1984 3 p

(AEL-FM-TM-84-4) Avail: NTIS HC A02/MF A01

The inviscid rotational flow field about an infinite cylinder of arbitrary cross-section is determined when the free stream velocity has a component perpendicular to the generators of the cylinder and arbitrary nonuniform component parallel to the generators.

Author

N86-20724*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

APPLICATION OF A RUNGE-KUTTA SCHEME FOR HIGH-SPEED INVISCID INTERNAL FLOWS Final Report

Anutosh Moitra (SASC Technologies, Inc., Hampton, Va.), Eli Turkel, and Ajay Kumar Jan. 1986 26 p refs Previously announced as A86-19968

(Contracts NAS1-17070; NAS1-18107)

(NASA-CR-178053; ICASE-86-5; NAS 1.26:178053) Avail: NTIS HC A03/MF A01 CSCL 20D

A multi-stage Runge-Kutta method is analyzed for solving the two-dimensional Euler equations for external and internal flow problems. Subsonic, supersonic and, highly supersonic flows are studied. Various techniques for accelerating the convergence to a steady state are described and analyzed. Effects of the grid aspect ratio on the rate of convergence are evaluated. An enthalpy damping technique applicable to supersonic flows is described in detail. Numerical results for supersonic flows containing both oblique and normal shocks are presented confirming the efficiency of the method. Author

N86-20725# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Aeromechanics Div.

VISCOUS AND INTERACTING FLOW FIELD EFFECTS: PROCEEDINGS OF THE 9TH US AIR FORCE AND THE FEDERAL REPUBLIC OF GERMANY DATA EXCHANGE AGREEMENT MEETING Technical Report, May 1982 - May 1984

Anthony W. Fiore Aug. 1984 306 p refs Meeting held in Silver Spring, Md., 9-10 May 1984

(AD-A153020; AFWAL-84-3099) Avail: NTIS HC A14/MF A01 CSCL 20/4

In 1975 the U.S. Air Force and the Federal Republic of Germany signed a Data Exchange Agreement numbered AF-75-G-7440 titled Viscous and Interacting Flow Field Effects. The purpose was to exchange data in the area of boundary layer research. It included both experimental and theoretical boundary layer research at speeds from subsonic to hypersonic Mach numbers in the presence of laminar, transitional, and turbulent boundary layers. The main effort, in recent years, has been on turbulent boundary layers; both attached and separated. The research presented here report covers the period May 1982 to May 1984 with the results presented on 9 to 10 May 1984 at the Naval Surface Weapons Center in Silver Springs, Maryland. In the United States the research was

conducted in the Department of Defense, NASA and various Aircraft Corporations and Universities. In the Federal Republic of Germany, it was done in the DFVLR - AVA and various Companies and Universities. For individual titles, see N86-20726 through N86-20739.

N86-20726# Mississippi State Univ., Mississippi State.
A DISCRETE ELEMENT PREDICTION APPROACH FOR TURBULENT FLOW OVER ROUGH SURFACES
R. P. Taylor, H. W. Coleman, and B. K. Hodge *In* AFWAL Viscous and Interacting Flow Field Effects Aug. 1984 p 1-11 (For primary document see N86-20725 11-34)
(AD-P004787) Avail: NTIS HC A14/MF A01 CSCL 20/4

A discrete element model for turbulent flow over rough surfaces has been rigorously derived from basic principles. This model includes surface roughness effects as a constitutent part of the partial differential equations which describe momentum and energy transport in turbulent flows. The model includes the necessary empirical information on the interaction between the roughness elements and the flow around and between the elements in a general way which does not require experimental data on each specific surface. This empirical information is input via algebraic models for the local element drag coefficient and Nusselt number. These models were calibrated by comparison with base data sets from surfaces with three-dimensional (distributed) roughness elements. Calculations using the present model have been compared with experimental data from 118 separate experimental runs. The results of these comparisons ranged from good to excellent. The calculations compared equally well with both transitionally rough and fully rough turbulent flow results without modification of the roughness model. GRA

N86-20727# Boeing Commercial Airplane Co., Seattle, Wash.
SHOCK/BOUNDARY-LAYER INTERACTION MODEL FOR THREE-DIMENSIONAL TRANSONIC FLOW CALCULATIONS
J. D. McLean and T. K. Matoi *In* AFWAL Viscous and Interacting Flow Field Effects Aug. 1984 p 45-77 (For primary document see N86-20725 11-34)
(AD-P004788) Avail: NTIS HC A14/MF A01 CSCL 20/4

A new computational model for three-dimensional shock-boundary layer interaction has been developed for use in viscous transonic flow calculations. In general, the new model has been found to be an improvement over the old method in which the boundary-layer equations are simply integrated through the shock. The basic empirical content of the method was tested against detailed boundary-layer measurements in two-dimensional transonic airfoil flows, and the new model was found, in general, to give better agreement with experiment. The new model has also been tested in coupled viscous-inviscid interaction calculations for wings and for nacelles. GRA

N86-20728# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany).
BOUNDARY SEPARATION DUE TO WEAK AND STRONG VISCOUS-INVISCID INTERACTION ON AN INCLINED BODY OF REVOLUTION
H. U. Meier and H. P. Kreplin *In* AFWAL Viscous and Interacting Flow Field Effects Aug. 1984 p 79-76 (For primary document see N86-20725 11-34)
(AD-P004789) Avail: NTIS HC A14/MF A01 CSCL 20/4

Detailed measurements in three-dimensional boundary layers and separated flow fields, developing on a prolate spheroid and flow visualizations are presented. The discussion is concentrated on the possible topological structure of separation patterns resulting from laminar on turbulent boundary layer flows at different Reynolds numbers. Author (GRA)

N86-20729# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany).
EXPERIMENTAL STUDY OF VORTICAL FEATURES IN THREE-DIMENSIONAL SEPARATED FLOWS
H. Bippes *In* AFWAL Viscous and Interacting Flow Field Effects Aug. 1984 p 97-117 (For primary document see N86-20725 11-34)
(AD-P004790) Avail: NTIS HC A14/MF A01 CSCL 20/4

Possible topological structures of three-dimensional separated flows are studied on a hemisphere-cylinder at incidence. By means of a systematic variation of flow parameters a manifold of skin-friction patterns is produced. It is established that they develop from three basic structures simply by successive splitting of saddles in saddle-node-saddle combinations. The adjoining spatial flow field is visualized in low Reynolds number water tunnel flow, where similar kind of skin friction pattern develops as in fully turbulent flow. Velocity field measurements in the separated region on a rectangular wing indicate that on both models a similar topological structure, including unsteady effects, is possible. Author (GRA)

N86-20730*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AXISYMMETRIC BLUFF-BODY DRAG REDUCTION THROUGH GEOMETRICAL MODIFICATIONS
F. G. Howard and W. L. Goodman *In* AFWAL Viscous and Interacting Flow Field Effects Aug. 1984 p 119-129 (For primary document see N86-20725 11-34)
(AD-P004791) Avail: NTIS HC A14/MF A01 CSCL 20D

The effect of shoulder radiusing and grooving (longitudinally or circumferentially) the afterbodies of bluff bodies of reduce the base drag at low speeds is discussed. Shoulder radii as large as 2.75 body diameters are examined. Reynolds number based on body diameter varied from 20,000 to 200,000. Results indicate that increasing the shoulder radius to 2.75 body diameters can reduce the drag levels to those of a streamline body having 67 percent greater fineness ratio. For the relatively sharp shoulder case, body drag reductions as large as 50% are obtained using circumferential or longitudinal grooves. Author (GRA)

N86-20731# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany).
EXPERIMENTAL INVESTIGATIONS ON BODIES WITH NONCIRCULAR CROSS SECTIONS IN COMPRESSIBLE FLOW (PRESSURE DISTRIBUTIONS)
W. Schneider *In* AFWAL Viscous and Interacting Flow Field Effects Aug. 1984 p 131-153 (For primary document see N86-20725 11-34)
(AD-P004792) Avail: NTIS HC A14/MF A01 CSCL 20/4

The present results were obtained in a continuation of extensive investigations on bodies with noncircular cross sections. Such bodies became important for various payload transport missions of missiles rather than for their smaller radar signature. The objective of these studies is to get a better insight into the complex flow phenomena and to provide a useful data base for theoretical efforts in this area. Author (GRA)

N86-20732# Naval Surface Weapons Center, Silver Spring, Md.
MACH 3 THREE-DIMENSIONAL BOUNDARY LAYER TURBULENCE TRANSPORT PROPERTIES ON A SPHERICALLY BLUNT CONE
D. W. Ausherman and W. J. Yanta *In* AFWAL Viscous and Interacting Flow Field Effects Aug. 1984 p 155-178 (For primary document see N86-20725 11-34)
(AD-P004793) Avail: NTIS HC A14/MF A01 CSCL 20/4

Three-dimensional boundary layer measurements were carried out on a 7-degree semi-vertex angle conical body configuration for angles-of-attack of 0 deg, 2 deg, and 4 deg in the NSWC Supersonic Tunnel Number Two. Tests were conducted at a freestream Mach number of 3 for a nominal freestream Reynold number of 2.3 x 1000000/ft (7.5 x 1000000/m) on a cone with a nominal 22% spherically blunt nose. Measurements of the three mean velocity component, turbulence, intensities, and Reynolds stresses were obtained at various circumferential locations around the body for one axial station using a 3-D Laser Doppler Velocimeter system. In addition, surface Preston probe and static pressure measurements were obtained at five axial stations along the body. The effects of angle-of-attack and model roll position on the three-dimensional mean velocities, boundary layer turbulence properties, and surface parameters are discussed herein.
Author (GRA)

N86-20733# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
AN EXPERIMENTAL INVESTIGATION OF THE STABILITY OF THE LAMINAR BOUNDARY LAYER ON A CONE AT m=8
K. F. Stetson, E. R. Thompson, J. C. Donaldson, and J. G. Siler *In its* Viscous and Interacting Flow Field Effects Aug. 1984 p 179-186 (For primary document see N86-20725 11-34)
(AD-P004794) Avail: NTIS HC A14/MF A01 CSCL 20/4

The stability of the laminar boundary layer on a 7-degree half angle cone at M infinity = 8 was experimentally investigated using hot-wire anemometry techniques. The principle instability of the hypersonic boundary layer was associated with second mode disturbances. The frequency of the most amplified disturbances was directly related to the boundary layer thickness. Small nosetip bluntness was found to make significant changes, compared to a sharp cone, in the stability characteristics of the boundary layer. GRA

N86-20734# Naval Surface Weapons Center, Silver Spring, Md.
BOUNDARY-LAYER TRANSITION ON BLUNT SLENDER CONES AT MACH 10
R. L. Bell *In* AFWAL Viscous and Interacting Flow Field Effects Aug. 1984 p 187-205 (For primary document see N86-20725 11-34)
(AD-P004795) Avail: NTIS HC A14/MF A01 CSCL 20/4

Investigations of the effects of nose blunting on the location of boundary-layer transition on slender cones at supersonic or hypersonic speeds so back 25 years. For some time it was thought that the movement of the transition point was simply due to the reduction in local Reynolds number associated with the loss in total pressure through the bow shock. More recently, it has been shown that variations in the local transition Reynolds number also occur on a blunt cone and that both these effects must be taken into account in explaining the observed movement in transition along the cone frustum. The present investigation was carried out as a demonstration test for the development of a new capability in Hypervelocity Tunnel 9 at the Naval Surface Weapon Center. The objective of this development effort was to raise the Reynolds number at mach 10 from about 5 x 1000000 per foot to 20 x 1000000 per foot. This was done so that naturally turbulent boundary layers (i.e., without tripping) could be obtained on R/V models. Thus an investigation of boundary layer transition was an appropriate choice for the demonstration test. GRA

N86-20735# Naval Surface Weapons Center, Silver Spring, Md.
LOW REYNOLDS NUMBER HYPERSONIC TESTING IN THE NSWC HYPERVELOCITY WIND TUNNEL 9
E. R. Hedlund, W. C. Ragsdale, and R. L. P. Voisinet *In* AFWAL Viscous and Interacting Flow Field Effects Aug. 1984 p 207-241 (For primary document see N86-20725 11-34)
(AD-P004796) Avail: NTIS HC A14/MF A01 CSCL 20D

The capabilities of the NSWC Hypervelocity Wind Tunnel 9 have been extended to simulate higher altitudes. A second ejector has been installed to allow operation at a supply pressure of 60 psia. Compression heating has been used to increase the supply temperature. High quality flow is obtained in a large core diameter. Static forces and moments on a subscale model have been successfully measured in a series of verification tests. GRA

N86-20736# Ballistic Research Labs., Aberdeen Proving Ground, Md.
NAVIER-STOKES COMPUTATIONS OF TRANSONIC FLOW OVER A PROJECTILE WITH A TWO-EQUATION MODEL OF TURBULENCE
J. Sahu and J. E. Darberg *In* AFWAL Viscous and Interacting Flow Field Effects Aug. 1984 p 243-256 (For primary document see N86-20725 11-34)
(AD-P004797) Avail: NTIS HC A14/MF A01 CSCL 20/4

A thin-layer Navier-Stokes code has been used to compute the axisymmetric turbulent flow over a projectile at transonic speeds. The thin layer form of the compressible Navier-Stokes equations is solved using a time dependent, implicit numerical algorithm. Numerical computations have been made using aero-equation (algebraic) and two-equation (kinetic energy and length scale) turbulence eddy viscosity models. The algorithm, and how the turbulence models are incorporated into it, are described. Computed results have been obtained for a secant-ogive-cylinder-boattail shape at M infinity = .94 and .97 using both models and are compared with experiment. Author (GRA)

N86-20737# Naval Surface Weapons Center, Silver Spring, Md.
PNS (PARABOLIZED NAVIER-STOKES) COMPUTATIONS FOR NONCIRCULAR AND FINNED BODY CONFIGURATIONS AT SUPERSONIC VELOCITIES
R. U. Jettmar and W. Kordulla *In* AFWAL Viscous and Interacting Flow Field Effects Aug. 1984 p 257-270 (For primary document see N86-20725 11-34)
(AD-P004798) Avail: NTIS HC A14/MF A01 CSCL 20/4

The Parabolized Navier-Stokes (PNS) equations are used to predict the viscous supersonic flow field over tangent-ogive-cylinder bodies with noncircular cross-section and finned body configurations. Current design interests make it desirable to gain some advanced knowledge of the aerodynamic characteristics of such bodies. Since the solution of the full, unsteady, Reynolds-averaged Navier-Stokes equations has its limitation due to computational resources, considerable interest exist in applying the PNS model to obtain a viscous supersonic flow field over realistic, complex configurations. GRA

N86-20738# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany).
EFFECTS OF PROPULSIVE JET ON THE FLOW FIELD IN THE TAIL REGION OF A MISSILE IN A SUPERSONIC STREAM
G. Koppenwallner, D. Rammenzweig, and W. Stahl *In* AFWAL Viscous and Interacting Flow Field Effects Aug. 1984 p 271-292 (For primary document see N86-20725 11-34)
(AD-P004799) Avail: NTIS HC A14/MF A01 CSCL 02/4

Work concentrated on the effects of an under-expanded supersonic jet on the external supersonic flow past a typical missile configuration. Jet simulation in the wind tunnel was achieved by means of a small Ludwieg tube, which allowed jet operation times of about 0.1 s. The circular cylinder missile model with ogival nose had three different afterbody configurations: cylindrical, and conical boat tailing of 5 deg and 10 deg respectively. The experiments were carried out in the DFVLR High-Speed Wind tunnel at free-stream Mach numbers of Ma infinity = 1.5 and Ma infinity = 1.98; angles of attack were varied between alpha = -4 deg and alpha = 8 deg. Base pressures and pressure distributions on the afterbodies were measured without jet and with jets of various exit-pressure ratios. Schlieren pictures were taken in order to get some insight into the flow field in the tail region of the missile, especially with respect to flow separation. GRA

N86-20739# Ballistic Research Labs., Aberdeen Proving Ground, Md.
NAVIER-STOKES CALCULATIONS OF BASE REGION FLOW FIELDS FOR BODIES OF REVOLUTION
J. Sahu, C. J. Nietubicz, and J. L. Steger *In* AFWAL Viscous and Interacting Flow Field Effects Aug. 1984 p 293-304 (For primary document see N86-20725 11-34)
(AD-P004800) Avail: NTIS HC A14/MF A01 CSCL 20/4

A computational capability has been developed for predicting the entire flow field about bodies of revolution including the base region. The additional complexity of base bleed and base jet effects have also been incorporated into is new capability. The thin-layer form of the compressible Navier-Stokes equations is solved using a time dependent, implicit algorithm. Numerical solutions have been obtained for a secant-ogive-cylinder projectile for $.9 < M < 1.2$ both with and without base bleed. Base drag has been computed and compared with experimental and semi-empirical data. The reduction in base drag with base bleed has been clearly shown for various mass injection rates. Additionally, the effect of a centered propulsive jet on base flow has been computed where the free stream Mach number is 1.343 and the jet exit Mach number is 2.7. Computed results show both qualitative and quantitative features of the base region flow fields. GRA

N86-20740# Wisconsin Univ., Madison.
OPTIMAL CONTROL TECHNIQUES FOR COMPUTING STATIONARY FLOWS OF VISCOELASTIC FLUIDS Technical Summary Report
Patrick LeTallec Aug. 1985 22 p
(Contract DAAG29-80-C-0041)
(AD-A160993; MRC-TSR-2852) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document considers the problem of computing the stationary flows of a viscoelastic fluid flowing through a given domain. The proposed numerical method is based on optimal control techniques, which replace the original equations of the problem by a minimization problem to be solved by a descent method. Such techniques are very powerful and can handle equations which change type, provided that, as done here, one uses an adequate preconditioning strategy and that one computes efficiently the gradient of the function to be minimized.
Author (GRA)

N86-20741# Manchester Coll. of Science and Technology (England). Dept. of Mechanical Engineering.
COMPUTATION OF FLOW AND HEAT TRANSFER IN FLOW AROUND A 180 DEG BEND
B. E. Launder Oct. 1985 132 p
(Contract N00014-83-G-0021)
(AD-A161789) Avail: NTIS HC A07/MF A01 CSCL 20/4

This research year saw the completion of the research on turbulent convective heat transfer in 180 deg bends. The main research effort during the year was directed at bends of circular cross section. Two sections deal with experimental and computational aspects of this work. These are preceded by a brief account of further computational work in the squared-sectional duct. GRA

N86-20742# Argonne National Lab., Ill.
NATURAL CONVECTIVE BEHAVIOR OF EBR-2 FOLLOWING A LOSS OF FLOW FROM DECAY HEAT LEVELS
L. K. Chang, D. Mohr, E. E. Feldman, P. R. Betten, and H. P. Planchon 1985 4 p Presented at the International Symposium on Fundamental Aspects of Gas-liquid Flows, Miami, FL., 17 Nov. 1985
(Contract W-31-109-eng-38)
(DE85-006885; CONF-851103-1) Avail: NTIS HC A02/MF A01

Eight loss-of-flow transients were conducted at initial decay heat levels of 0.75 to 1.6% of the rated EBR-II power. The data indicate that the natural convective flow was adequate to remove the decay heat without overheating the reactor core. Good agreement with NATDEMO and HOTCHAN predictions was obtained. DOE

N86-20743# Sandia National Labs., Albuquerque, N. Mex.
PROJECTILE AND IMPACTOR DESIGNS FOR PLATE-IMPACT EXPERIMENTS
J. R. Asay, L. C. Chhabildas, and L. M. Barker Oct. 1985 46 p
(Contract DE-AC04-76DP-00789)
(DE86-001680; SAND-85-2009) Avail: NTIS HC A03/MF A01

The use of plate-impact techniques for producing a variety of loading histories in plane wave experiments is discussed. Specific techniques concern direct shock compression, shock compression followed by unloading, shock compression followed by further loading, shock compression followed by unloading and then reloading (cyclic loading), shockless compression (quasi-isentropic loading), and pressure-shear loading. Emphasis is placed on the considerations of projectile and impactor design and the constraints of structural loading during projectile acceleration, which are associated with these loading conditions. DOE

N86-20744# Los Alamos National Lab., N. Mex.
ELASTIC WAVE SCATTERING METHODS: ASSESSMENTS AND SUGGESTIONS
J. E. Gubernatis 1985 14 p Presented at the Review of Progress in Quantitative NDE, Williamsburg, Virg., 23 Jun. 1985
(Contract W-7405-eng-36)
(DE86-000757; LA-UR-85-3309; CONF-8506110-4) Avail: NTIS HC A02/MF A01

Elastic wave scattering methods were reviewed and assessed for the past ten years to suggest areas of future research opportunities. Developments are highlighted, focusing on distinct steps forward in the theoretical understanding of how elastic waves interact with flaws. For references and illustrative figures, it was decided to use as a principal source the proceedings of the various annual Reviews of Progress in Quantitative Nondestructive Evaluation (NDE). These meetings have been the main forum not only for presenting results of theoretical research but also for demonstrating the relevance of the theoretical research for the design and interpretation of experiment. A quantitative NDE is possible only if this relevance exists, and the major objective is to discuss and illustrate the degree to which relevance has developed. DOE

N86-20745# Sandia National Labs., Albuquerque, N. Mex.
CALCULATED TRANSIENT TWO-DIMENSIONAL MARANGONI FLOW IN A PULSED-LASER WELD POOL
A. J. Russo 18 Apr. 1985 23 p Presented at the American Society of Mechanical Engineers Winter Annual Meeting, Miami, Fla., 17 Nov. 1985
(Contract DE-AC04-76DP-00789)
(DE85-010671; SAND-85-0225C; CONF-851125-1) Avail: NTIS HC A02/MF A01

Pulsed-laser welding produces short-lived weld pools which have strong radial temperature gradients at the pool surface. These gradients produce surface tension variations which usually reinforce the weak natural convective flows caused by radial temperature gradients. The flow in the molten pool is of interest because it can change the temperature distribution in and around the molten zone which can alter the weld shape, and because it controls the transport of surface contaminants (or alloying or doping materials in case of surface processing) into the substrate. A two-dimensional finite difference code is being developed to model the transient flow in a prescribed axisymmetric weld pool geometry. A flux corrected transport algorithm is used with a vorticity-steamfunction formulation of the problem to calculate the flow field. Flow velocities during a typical laser pulse are presented for nickel and steel.
DOE

N86-20746# Oklahoma Univ., Norman. School of Chemical Engineering and Materials Science.
THERMOPHYSICAL PROPERTIES CORRELATIONS AND PSEUDOCOMPONENT CHARACTERIZATION PARAMETER ESTIMATION FOR FOSSIL FLUIDS Annual Report, 1 Sep. 1984 - 31 Aug. 1985
K. E. Starling, L. L. Lee, R. T. Ellington, S. Watanasiri, M. A. Khan, M. A. Langenberg, M. Mannan, and K. Sheth 1985 51 p
(Contract DE-FG22-83PC-60804)
(DE86-000197; DOE/PC-60804/T8; AR-2) Avail: NTIS HC A04/MF A01

This report summarizes work performed during the period September 1, 1984 through August 31, 1985. During this period, the companion correlations for dilute-gas viscosity and thermal conductivity have been developed. Both correlations are applicable to nonpolar, polar and associating fluids. The correlations require four characterization parameters as input, namely, critical temperature, critical volume, acentric factor, and dipole moment. One important feature of these correlations is that none of the characterization parameters has to be regressed from experimental viscosity or thermal conductivity data. This feature allows for apriori prediction of dilute gas viscosity and thermal conductivity. The correlation for dilute gas viscosity eta0 uses the Chapman-Enskog expression. The main departure from other earlier work on eta0 includes the use of the Stockmayer potential for polar and associating compounds. The dipole moment, along with molecular weight, critical temperature, critical volume and accentric factor, was found to be adequate in characterizing both polar and associating fluids studied in this work. A total of 757 data points were used covering 14 nonpolar, 11 polar, and 7 associative fluids. The overall deviation is 1.37%. DOE

N86-20747# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
VORTEX GENERATION AT SHARP EDGES: TWO AND THREE-DIMENSIONAL EFFECTS Thesis
D. Auerbach May 1985 88 p refs
(MPIS-12/1985; ISSN-0436-1199) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlrsuhe, West Germany DM 33

Vortices were generated at straight edges by an impulsively-started flow of water to determine steady and unsteady global aspects of the flow as the edge-angle was varied from 0 to 180 deg; trajectories of the vortex centers in the mid-plane during vortex generation for edge-angles 0 to 145 deg; and vorticity distributions and circulations at the nozzle in the mid-plane for edge-angles 0, 90 and 180 deg. The temporal development of the flow shows 3 phases; an initial phase, in which no vortex generates, the flow remaining attached despite the sharpness of the edge; a vortex-generating phase; and a final phase, which remains steady for a Reynolds number < 3000 for nozzle-type flows and Re < 10,000 for diffusor-type flows. Author (ESA)

N86-20748# Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.
IMPLEMENTATION OF A PREPROCESSOR FOR A SHOCK WAVE LOADING
J. vanBeest 3 Dec. 1985 18 p refs
(B8575342) Avail: NTIS HC A02/MF A01

Determination of explosion shock wave loading on a structure in the ICES-STRUDL program is outlined. Assuming that the peak overpressure, the duration of the positive phase, and the direction of the shock wave are known, the overpressure at any point of the structure may be determined using the shock wave loading. Author (ESA)

N86-20749# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
UTILIZATION OF THE SYMBOLIC MANIPULATION SYSTEM REDUCE 2 FOR DERIVING EQUATIONS OF MOTION
W. P. Koppens Jul. 1983 24 p refs Sponsored by Stichting voor de Technische Wetenschappen
(VTH-M-477) Avail: NTIS HC A02/MF A01

In order to reduce computing times in direct application of Lagrange's equations for deriving equations of motion with the symbolic manipulation system REDUCE 2, the kinetic energy part in Lagrange's equations was rewritten in terms of global displacements. Formulations for nonlinear equations of motion, linearized equations of motion, and linearized perturbation equations are presented. Derivations based on these formulations lead to acceptable computing times. Two examples of the input data and output data are given. Author (ESA)

N86-20604# Naval Civil Engineering Lab., Port Hueneme, Calif.
EFFECT OF FRANGIBLE PANELS ON INTERNAL GAS PRESSURES
J. E. Tancreto and E. S. Helseth *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 365-394 (For primary document see N86-20589 11-31)
(AD-P004835) Avail: NTIS HC A99/MF E03 CSCL 19/4

N86-20620# Naval Surface Weapons Center, Silver Spring, Md.
REACTION PROPAGATION ALONG AN ENCLOSED CONVEYOR
P. J. Peckham and M. M. Swisdak, Jr. *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 789-806 (For primary document see N86-20589 11-31)
(AD-P004859) Avail: NTIS HC A99/MF E03 CSCL 19/4

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N86-20750* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
HIGH GRADIENT DIRECTIONAL SOLIDIFICATION FURNACE Patent
Billy R. Aldrich and William D. Whitt, inventor (to NASA) Issued 1 Oct. 1985 9 p Filed 17 Jan. 1984
(NASA-Case-MFS-25963-1; US-Patent-4,544,025; US-Patent-Appl-SN-571614; US-Patent-Class-165-65; US-Patent-Class-165-61; US-Patent-Class-165-30; US-Patent-Class-219-390; US-Patent-Class-219-395; US-Patent-Class-219-396; US-Patent-Class-432-18) Avail: US Patent and Trademark Office CSCL 14B

A high gradient directional solidification furnace is disclosed which includes eight thermal zones throughout the length of the furnace. In the hot end of the furnace, furnace elements provide desired temperatures. These elements include Nichrome wire received in a grooved tube which is encapsulated y an outer alumina core. A booster heater is provided in the hot end of the furnace which includes toroidal tungsten/rhenium wire which has a capacity to put heat quickly into the furnace. An adiabatic zone is provided by an insulation barrier to separate the hot end of the furnace from the cold end. The old end of the furnace is defined by additional heating elements. A heat transfer plate provides a means by which heat may be extracted from the furnace and conducted away through liquid cooled jackets. By varying the input of heat via the booster heater and output of heat via the heat transfer plate, a desired thermal gradient profile may be provided. Official Gazette of the U.S. Patent and Trademark Office

N86-20751* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LABORATORY GLASSWARE RACK FOR SEISMIC SAFETY Patent
Marc M. Cohen, inventor (to NASA) Issued 1 Oct. 1985 10 p Filed 16 Aug. 1983
(NASA-Case-ARC-11422-1; US-Patent-4,544,068; US-Patent-Appl-SN-523991; US-Patent-Class-211-74; US-Patent-Class-211-126) Avail: US Patent and Trademark Office CSCL 14B

A rack for laboratory bottles and jars for chemicals and medicines has been designed to provide the maximum strength and security to the glassware in the event of a significant earthquake. The rack preferably is rectangular and may be made of a variety of chemically resistant materials including polypropylene, polycarbonate, and stainless steel. It comprises a first plurality of parallel vertical walls, and a second plurality of parallel vertical walls, perpendicular to the first. These intersecting vertical walls comprise a self-supporting structure without a bottom which sits on four legs. The top surface of the rack is formed by the top edges of all the vertical walls, which are not parallel but are skewed in three dimensions. These top edges form a grid matrix having a number of intersections of the vertical walls which define a number of rectangular compartments having varying widths and lengths and varying heights.

Official Gazette of the U.S. Patent and Trademark Office

N86-20752* National Aeronautics and Space Administration. Pasadena Office, Calif.
VIBRATING-CHAMBER LEVITATION SYSTEMS Patent
Martin B. Barmatz, Dan Granett, and Mark C. Lee, inventors (to NASA) Issued 29 Oct. 1985 6 p Filed 14 Dec. 1983
(NASA-Case-NPO-16142-1-CU; US-Patent-4,549,435;

US-Patent-Appl-SN-561433; US-Patent-Class-73-505) Avail: US Patent and Trademark Office CSCL 14B

Systems are described for the acoustic levitation of objects, which enable the use of a sealed rigid chamber to avoid contamination of the levitated object. The apparatus includes a housing forming a substantially closed chamber, and means for vibrating the entire housing at a frequency that produces an acoustic standing wave pattern within the chamber.

Official Gazette of the U.S. Patent and Trademark Office

N86-20753*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

NEW METHOD FOR DETERMINING HEATS OF COMBUSTION OF GASEOUS HYDROCARBONS

Jag J. Singh, Danny R. Sprinkle, and Richard L. Puster Dec. 1985 13 p refs

(NASA-TP-2531; L-16054; NAS 1.60:2531) Avail: NTIS HC A02/MF A01 CSCL 14B

As a spin off of a system developed for monitoring and controlling the oxygen concentration in the Langley 8-foot High Temperature Tunnel, a highly accurate on-line technique was developed for determining heats of combustion of natural gas samples. It is based on measuring the ratio m/n, where m is the (volumetric) flowrate of oxygen required to enrich the carrier air in which the test gas flowing at the rate n is burned, such that the mole fraction of oxygen in the combustion product gases equals that in the carrier air. The m/n ratio is directly related to the heats of combustion of the saturated hydrocarbons present in the natural gas. A measurement of the m/n ratio for the test gas can provide a direct means of determination of its heat of combustion by using the calibration graph relating the m/n values for pure saturated hydrocarbons with their heats of combustion. The accuracy of the technique is determine solely by the accuracy with which the flowrates m and n can be measured and is of the order of 2 percent in the present study. The theoretical principles and experimental results are discussed. Author

N86-20754*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

METHOD OF FABRICATING AN IMAGING X-RAY SPECTROMETER Patent Application

George E. Alcorn and Andre S. Burgess, inventors (to NASA) Filed 18 Jun. 1985 11 p

(NASA-Case-GSC-12956-1; NAS 1.71:GSC-12956-1; US-Patent-Appl-SN-745977) Avail: NTIS HC A02/MF A01 CSCL 14B

A process for fabricating an X-ray spectrometer having imaging and energy resolution of X-ray sources is discussed. The spectrometer has an array of adjoining rectangularly shaped detector cells formed in a silicon body. The walls of the cells are created by laser drilling holes completely through the silicon body and diffusing n(+) phosphorous doping material therethrough. A thermally migrated aluminum electrode is formed centrally through each of the cells. NASA

N86-20755*# National Aeronautics and Space Administration. Pasadena Office, Calif.

A WATER-ABSORBING CAPACITOR SYSTEM FOR MEASURING RELATIVE HUMIDITY Patent Application

Eric G. Laue, inventor (to NASA) (JPL, Pasadena, Calif.) Filed 20 Jun. 1985 12 p

(NASA-Case-NPO-16544-1-CU; NAS 1.71:NPO-16544-1-CU; US-Patent-Appl-SN-746809) Avail: NTIS HC A02/MF A01 CSCL 14B

A method and apparatus using a known water-absorbent polymer as a capacitor which is operated at a DC voltage for measuring relative humidity is presented. When formed as a layer between porous electrically-conductive electrodes and operated in an RC oscillator circuit, the oscillator frequency varies inversely with the partial pressure of the moisture to be measured. In a preferred embodiment, the capacitor is formed from Nafion and is operated at a low DC voltage wih a resistor as an RC circuit in an RC oscillator. At the low voltage, the leakage current is proper for oscillation over a satisfactory range. The frequency of oscillation varies in an essentially linear fashion with relative humidity which is represented by the moisture being absorbed into the Nafion. The oscillation frequency is detected by a frequency detector. NASA

N86-20756*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

FLUID LEAK INDICATOR Patent Application

George E. Anderson (Rockwell International Corp., Pittsburg, Pa.) and Shu Loo, inventors (to NASA) (Rockwell International Corp., Pittsburg, Pa.) Filed 29 May 1985 14 p

(NASA-Case-MSC-20783-1; NAS 1.71:MSC-20783-1; US-Patent-Appl-SN-738931) Avail: NTIS HC A02/MF A01 CSCL 14B

A fluid leak indicator for detecting and indicating leaks in visually inaccessible fluid tubing joints, such as those obstructed by insulation includes a bag system and a wicking system surrounding or wrapping the joints under the visual obstructing material. Leaking fluid is collected in the bag or on the wicking material where it is conducted along the wicking material to a visily accessible capturing transparent indicator bulb for providing a visual indication of the leak without requiring a chemical change in the capturing indicator bulb. NASA

N86-20757*# Stanford Univ., Calif. Center for Space Science and Astrophysics.

THE DEVELOPMENT AND TEST OF MULTI-ANODE MICROCHANNEL ARRAY DETECTOR SYSTEMS. PART 2: SOFT X-RAY DETECTORS Progress Report, 1 Aug. 1985 - 31 Jan. 1986

J. G. Timothy [Mar. 1986] 17 p refs

(Grant NAG5-622)

(NASA-CR-176593; NAS 1.26:176593) Avail: NTIS HC A02/MF A01 CSCL 14B

Detector systems based on the high gain microchannel plate (MCP) electron multiplier were used extensively for imaging at soft X-ray wavelengths both on the ground and in space. The latest pulse counting electronic readout systems provide zero readout noise, spatial resolutions (FWHM) of 25 microns or better and can determine the arrival times of detected photons to an accuracy of the order of 100 ns. These systems can be developed to produce detectors with active areas of 100 nm in diameter or greater. The use of CsI photocathodes produces very high detective quantum efficiencies at wavelengths between about 100 and 1A (approximately 0.1 to 10 keV) with moderate energy resolution. The operating characteristics of the different types of soft X-ray MCP detector systems are described and the prospects for future developments are discussed. Author

N86-20758*# California Inst. of Tech., Pasadena. Big Bear Solar Observatory.

THE CALIBRATRION OF DOPPLERGRAMS AND MAGNETOGRAMS AT BBSO

Zhongxian Shi (Academia Sinica, Beijing, China), Jingxiu Wang (Academia Sinica, Beijing, China), and Alan Patterson [1986] 10 p refs

(Grants NGL-05-002-034; NSF ATM-82-11002)

(NASA-CR-176598; NAS 1.26:176598; BBSO-0257) Avail: NTIS HC A02/MF A01 CSCL 14B

The calibration procedure for the Big Bear Solar Observatory (BBSO) videomagnetograph in which the radial velocity of the sidereal rotation of the Sun is used as a calibrator is described. One of the key points of the procedure is to eliminate the effects of the Earth's motion relative to the Sun and the temperature instability of the birefringent filter by tuning the bandpass of the birefringent filter. The other is to make the light level of the direct image of the videomagnetograph the same both in Doppler and in Zeeman modes in order to reduce the errors introduced by imperfect linearity of the transfer curve of the camera tube. Some practical problems of calibration are discussed for further improvement. Author

N86-20759# National Aerospace Lab., Tokyo (Japan).
STUDY ON THE DIGITAL POSITION TRANSDUCER WITH OPTICAL TIME-DELAY PULSE
Mitsuyoshi Mayanagi 1985 40 p refs In JAPANESE; ENGLISH summary
(NAL-TR-878; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

A rotary optical position transducer employing a pulse technique time delay multiplexor was studied during the development of a Fly-By-Light (FBL) for the aircraft control system, the aim of which is to offer inherent resistance to environments of electromagnetic interference (EMI), electromagnetic pulse (EMP) and lightning. The conventional absolute type optical digital transducer causes difficulty in the interface technique between the transducer and other devices such as a computer. The transducer system described consisting of a rotary position transducer unit, fiber optic cable, light source unit, and electronics interface unit, can improve this interface technique. The rotary transducer unit is an electrically passive device connected through optical fibers to the light source unit and electronics interface unit, and has many advantages of fiber optic techniques. Basic problems in the development of the rotary transducer system were studied. In particular, a basis for optimizing illumination irradiance and photodetector characteristics is given, and the intrinsic performance of the transducer is quantitatively examined. Author

N86-20760# National Aerospace Lab., Tokyo (Japan).
A PRESSURE MEASURING SYSTEM USING ELECTRONICALLY SCANNED PRESSURE SENSORS (ESP) INSTALLED IN A TRANSONIC BLOWDOWN WIND TUNNEL
Toshimi Fujita, Katsuichi Murota, and Koichi Suzuki 1985 52 p refs In JAPANESE; ENGLISH summary
(NAL-TR-883; ISSN-0389-4010) Avail: NTIS HC A04/MF A01

A pressure measuring system using electrically scanned pressure sensors (ESP) was built and installed in a transonic blowdown wind tunnel, and thoroughly tested to see how effective an ESP system is in enhancing data productivity when compared with the scanivalve system hitherto used. After a brief description of what an ESP is and how to use it, detailed results are given of studies in which linearity, stability and repeatability characteristics of our ESP system was examined. It is shown that the deviation of the system output from linearity is less than 0.25% of the full-scale value (FS), that the thermal zero shift is of negligible magnitude and that the repeatability is also quite satisfactory. The pressure sensors were placed in the plenum chamber surrounding the test section, where the temperature change during the tunnel operation remains rather small (generally about 1 C). This environmental stability contributed to the excellent performance of our pressure measuring system. Author

N86-20761# Tri-Con Associates, Inc., Cambridge, Mass.
REFURBISHMENT OF AN ULTRAVIOLET AND ELECTRONIC SPECTROMETER AND PHOTOMETER Final Report, 26 Apr. 1983 - 31 Mar. 1985
R. S. Hills 29 Apr. 1985 41 p
(Contract F19628-82-C-0080)
(AD-A160363; C-208; AFGL-TR-85-0105) Avail: NTIS HC A03/MF A01 CSCL 14/2

Modification and field services for instruments launched on rocket from WSMR, New Mexico, 19 April 1983. Modification of shuttle Electron Spectrometer. Design, fabrication and launch services for Electron Spectrometer. on PIIE project launched on rocket from Sondrestrom Air Base, Greenland 14 March 1985. GRA

N86-20762# Pacific Northwest Lab., Richland, Wash.
ACOUSTICAL HOLOGRAPHIC SIAMESE IMAGE TECHNIQUE FOR IMAGING RADIAL CRACKS IN REACTOR PIPING
H. D. Collins and R. P. Gribbie Apr. 1985 9 p Presented at the 15th Symposium on Nondestructive Evaluation, San Antonio, Tex., 23 Apr. 1985
(Contract DE-AC06-76RL-01380)
(TI85-010976; PNL-SA-13149; CONF-8504119-1) Avail: NTIS HC A02/MF A01

Siamese imaging for quasi-vertical defects in reactor pipe weldments is described. The Siamese image is a bisymmetrical view of the inner surface defect. Image construction geometry consists of two probes operating either from opposite sides or the same side of the defect to be imaged. As the probes scan across a lower surface defect, they encounter two images--first the normal upright image and then the inverted image. The final integrated image consists of two images connected along their baseline. The experimental imaging results on simulated and natural cracks in reactor piping weldments graphically illustrate this unique technique. Excellent image of mechanical fatigue and thermal cracks were obtained on ferritic and austentic piping. Author

N86-20763# Fermi National Accelerator Lab., Batavia, Ill.
MEASURING HEAT LEAK WITH A HEATMETER
M. Kuchnir, J. D. Gonczy, and L. Tague Aug. 1985 8 p Presented at the Cryogenic Engineering Conference and International Cryogenic Materials Conference, Boston, Mass., 12 Aug. 1985
(Contract DE-AC02-76CH-03000)
(DE86-000240; FNAL-TM-1344; CONF-850814-21) Avail: NTIS HC A02/MF A01

The heatmeter or more precisely the heatflowmeter is a device based on thermal conductivity measuring techniques. It consists of a thermal conducting body between two thermometers, with provisions for thermal connections and calibration. The paper describes the design, construction details, calibration and performance of one such heatmeter for use with heat reservoirs at either 4.2 K or 78 K. Near 4.2 K it has a sensitivity of 10 micro W and requires less than a minute to reach steady state. Near 78 K its sensitivity is 10 MW and requires 25 minutes to reach steady state. DOE

N86-20764# Sandia National Labs., Albuquerque, N. Mex.
MOS-TRANSISTOR RADIATION DETECTORS AND X-RAY DOSE-ENHANCEMENT EFFECTS
L. D. Posey, T. F. Wrobel, D. C. Evans, W. Beezhold, J. G. Kelly, C. J. MacCallum, F. N. Coppage, T. F. Luera, and A. J. Smith 1985 7 p refs Presented at the 6th JOWOG Meeting, Aldermaston, England, 7 Oct. 1985 Prepared in cooperation with Ktech Corp., Albuquerque, N. Mex.
(Contract DE-AC04-76DP-00789)
(DE86-001320; SAND-85-1936C; CONF-8510165-1) Avail: NTIS HC A02/MF A01

Sandia National Laboratory (SNL) CMOS IC dose detectors and 3N161 MOS Transistors were evaluated as pulsed X-radiation dosimeters and used as monitors to measure dose-enhancement effects. Measurements were made in the photon environments from the HydraMITE II, SPR III, MBS and PITHON radiation sources. The dosimetric evaluation data suggest that the 3N161 MOS transistors are useful dosimeters for measuring flash X-ray-induced doses in the oxide layers of modern metal-oxide-semiconductor (MOS) integrated circuits. However, dose-enhancement calculations indicate that Monte Carlo codes, using 1-D geometries and calculated source spectra, consistently overpredict measured dose-enhancement ratios by factors as large as two. DOE

N86-20765# Lawrence Livermore National Lab., Calif.
PERFORMANCE CHARACTERIZATION OF AN IMAGE CONVERTER BASED STREAK CAMERA
C. C. Lai and L. B. Olk 20 Aug. 1985 9 p Presented at the SPIE International Technical Symposium on Optical and Electro-optical Engineers, San Diego, Calif., 18 Aug. 1985
(Contract W-7405-eng-48)
(DE86-001567; UCRL-92214; CONF-850887-39) Avail: NTIS HC A02/MF A01

The performance response of an electronic subnanosecond streak camera to a spatially distributed optical signal varies significantly with the image location on output screen. The variations are due mainly to the combined effects of (1) electron-optics aberrations, (2) camera sweep ramps and gating waveform imperfections, (3) photocathode and phosphor quantum efficiency

nonuniformities, and (4) excessive incident intensity or power. Consequently, a dynamic full-scale characterization of the streak camera is necessary for achieving a better measurement accuracy, relative or absolute. To meet this need, we are developing a simple yet versatile technique for characterizing the large-format image-converter-tube based streak cameras that are routinely used as the prime diagnostic instruments at the nuclear test site in Nevada. A mode-locked pulsed dye laser routing through beam splitters and mirrors provides the repetitive light source of multiple pulses with known intensities and inter-pulse timing for illumination along the streak sweep axis. Meanwhile, a bar-chart test pattern at the input slit intercepting an expanded form of the light source, or a bundle of equal-length fibers fanning out into a linear line array replacing the slit, distributes the illumination along the axis perpendicular to the sweep. In one single shot, this technique enables an accurate and detailed mapping of the key performance parametes of a large-format streak camera. The obtainable parameters include quantitative temporal and spatial resolutions, descriptive dynamic range, two-dimensional sweep nonlinearity, and intensity or power dependent distortions. Experimental setup is described. Sample test data, digitization plots, and computer analysis results are presented. DOE

N86-20766# Lawrence Livermore National Lab., Calif.
PHOTOPHORESIS AND THE SCATTERING OF ELECTROMAGNETIC RADIATION
J. R. Ipser Sep. 1985 12 p
(Contract W-7405-eng-48)
(DE86-001687; UCID-20541) Avail: NTIS HC A02/MF A01

Electron-microscope photographs of soot lend support to the picture in which a soot particle is modeled as a collection of chains of small carbon spheres. The soot particle itself is typically considerably larger than the small carbon spheres making up the chains. Thus the soot particles might have a size approx. 0.1 - 1 microns while the small carbon spheres might have a size approx. 0.03 microns in typical situations. Further, measurements of the density of soot yield values much less than that of normal carbon, indicating that an individual soot particle has a rather small filling factor, i.e., the fraction of the volume of the particle that is occupied by chains. If a soot particle is taken to be a sphere partially filled with carbon chains, what are its scattering and absorption properties. Several workers have adopted the view that the net scattering and absorption properties can be determined simply by summing the cross-sections for the individual small carbon spheres. It appears that in a first rough approximation the scattering and absorption properties of soot can be determined by estimating the effective dielectric constant of a soot sphere. DOE

N86-20767# Pacific Northwest Lab., Richland, Wash.
PORTABLE INSTRUMENTS FOR EMERGENCY RESPONSE
K. L. Swinth May 1985 16 p refs Presented at the Health Physics Summer School Conference, Evanston, Ill., 3 Jun. 1985
(Contract DE-AC06-76RL-01830)
(DE85-017928; PNL-SA-13225; CONF-8506136-3) Avail: NTIS HC A02/MF A01

The selection and use of instruments for emergency response is complicated by lack of specific guidance, the diversity of potential conditions, and the variable performance of available instruments. The user must examine the projected radiological conditions during an accident and the environmental extremes that could exist. This should assist in determining requirements that the instruments must meet during an emergency. Due to the variable performance of available instrumentation, critical parameters (temperature dependence) should be tested prior to use to assure adequate measurements. Although it is tempting to stock emergency kits with inexpensive monitoring equipment, one should carefully consider the possible conditions (environmental, radiological) and equipment performance since inaccurate measurements could be very costly in terms of decisions regarding lifesaving and evacuation during an emergency. DOE

N86-20768# Sandia National Labs., Albuquerque, N. Mex.
RADIOLOGICAL EQUIPMENT FOR EMERGENCIES
A. Stanley 1985 10 p Presented at the Advanced Management of Radiation Accidents, Albuquerque, N. Mex., 3 Oct. 1985
(Contract DE-AC04-76DP-00789)
(DE86-000432; SAND-85-2185C; CONF-8510164-1) Avail: NTIS HC A02/MF A01

A brief guide to training and equipment needed to effectively manage victims of radiation accidents is given. DOE

N86-20769# Wisconsin Univ., Madison. Dept. of Medical Physics.
RESPONSE OF A GAMMA-RAY TELESCOPE DOSIMETER TO THE (n + (GAMMA)) RADIATION FROM A (239)Pu-Be SOURCE
F. H. Attix, D. W. Pearson, and P. M. DeLuca, Jr. 1985 18 p
(Contract DE-AC02-76EV-01105)
(DE86-000850; DOE/EV-01105/316) Avail: NTIS HC A02/MF A01

The design, construction, and investigation of a gamma-ray telescope that can tell the direction of incident photons is reported. The dosimeter is based on LiF thermoluminescence. The gamma-ray telescope dosimeter was tested with a (239)Pu-Be source and found to perform satisfactorily. For a high-energy neutron field the gamma-ray telescope dosimeter contributes very little to the total dose equivalent. DOE

N86-20770# Rockwell International Corp., Golden, Colo.
EVALUATION OF THE ANALYSIS OF PLUTONIUM MATERIALS FOR LOW-LEVEL URANIUM USING A MODIFIED SCINTREX URANIUM ANALYZER (LASER FLUOROMETER)
C. E. Michel and J. R. Weiss 25 Sep. 1985 8 p refs
(Contract DE-AC04-76DP-03533)
(DE86-000880; RFP-3827) Avail: NTIS HC A02/MF A01

Evaluation and analysis of low-level uranium in plutonium materials using a modified Scintrex UA-3 Uranium Analyzer are described. Two liquid/liquid procedures for the separation of uranium from plutonium are compared. They are 0.1M tri-n-octylphosphine oxide (TOPO) in cyclohexane and 20% (v/v) tributyl phosphate (TBP) in 2,2,4-trimethylpentane (iso-octane). DOE

N86-20771# Groningen Rijksuniversiteit (Netherlands). Lab. for Space Research.
THE IRAS-DAX PHOTOMETRIC CHANNEL EXPLANATORY SUPPLEMENT
P. R. Wesselius, D. A. Beintema, A. R. W. deJonge, T. A. Jurriens, D. J. M. Kester, J. E. vanWeerden, J. deVries (ESA/ESTEC, Noordwijk, Netherlands), and M. Perault (Observatoire de Paris-Meudon, France) 6 Nov. 1985 68 p refs
Avail: NTIS HC A04/MF A01

Technical information required to interpret IRAS chopped photometric channel maps is presented. Observations; end products; the photometer; data reduction; and photometric calibration are covered. Author (ESA)

N86-20772# Technische Hogeschool, Delft (Netherlands). Lab. voor Technische Natuurkunde.
CALIBRATION AND TEST MEASUREMENTS OF A HIGH PURETY GERMANIUM BETA SPECTROMETER [CALIBRATIE-EN TESTMETINGEN AAN EEN HIGH-PURE GERMANIUM BETASPECTROMETER]
P. Coops Nov. 1983 93 p refs In DUTCH; ENGLISH summary
Avail: NTIS HC A05/MF A01

Calibration measurements of an on-line beta spectrometer are described. Distortions of the measured spectra, caused by the detection step, are discussed. A correction of the beta spectrum for coincidental gamma rays was introduced and put into the fitting program BCONT. Using a Co56 source, a performance test of the correction was carried out. The fitted Q-value (4566.54 (1.92) keV) agrees with the literature value. On-line measurements of the spectra of Au186 were carried out. Data analysis gives a Q-value of 4830 keV, over 1200 keV lower than the calculated Q-value in the literature. Author (ESA)

N86-20773# Environmental Research and Technology, Inc., Concord, Mass.
DEVELOPMENT OF A LOW COST NDIR (NON-DISPERSIVE INFRARED DETECTION) CO MONITOR Final Report, May 1983 - Aug. 1984
P. L. Kebabian and J. R. Kruse Aug. 1984 60 p refs
(Contract GRI-5082-251-0726)
(PB86-105053; Rept-840178; GRI-84/0178) Avail: NTIS HC A04/MF A01 CSCL 14B

A feasibility program was undertaken to develop a low cost CO detector for residential and commercial use utilizing non-dispersive infrared detection techniques. Experimental results are described along with details of a proposed design of an instrument incorporating techniques developed during this program. The design includes a fluorescent source of CO emission, a sample cell and a dual detector gas correlation sensor. Similar to size to a home smoke detector, the bench model has demonstrated a threshold sensitivity to CO of less than 20 ppm and no detectable interference from CO2, methane or water vapor. It has no moving parts or consumables and is inherently fail-safe. GRA

N86-20774# National Bureau of Standards, Gaithersburg, Md. Office of Standard Reference Materials.
FEASIBILITY STUDY FOR THE DEVELOPMENT OF STANDARDS USING DIFFERENTIAL SCANNING CALORIMETRY Final Report
J. E. Callanan, S. A. Sullivan, and D. F. Vecchia Aug. 1985 59 p refs
(PB86-106747; NBS/SP-260-99; LC-85-600567) Avail: NTIS HC A04/MF A01; also Avail. from SOD as N003-003-02675-1 CSCL 14B

The tremendous increase in the use of differential scanning calorimetry, coupled with the decrease in the capability for conventional precision calorimetry, has created a need for more and better thermal standards for use with scanning calorimeters and other thermal instruments currently available, such as thermomechanical analyzers. The development of these standards by methods such as adiabatic or drop calorimetry is impractical because of the number and variety of standards required, the associated expense, and the lack of facilities and personnel to do the certification. A two-part study was designed to evaluate the capability of a differential scanning calorimeter for developing temperature and enthalpy of fusion standards. Author (GRA)

N86-20421# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
CRYOGENIC WIND TUNNEL INSTRUMENTATION
M. Bazin *In* AGARD Special Course on Cryogenic Technology for Wind Tunnel Testing Jul. 1985 28 p refs Previously announced in IAA as A85-47284 (For primary document see N86-20415 11-09)
Avail: NTIS HC A18/MF A01

N86-20438# Joint Publications Research Service, Arlington, Va.
WORLD'S LARGEST CAMERA FOR SATELLITE OBSERVATION INSTALLED AT ZVENIGOROD
M. Rogozhnikov *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 18-19 Transl. into ENGLISH from Leninskoye Znamya (Moscow, USSR), 17 Oct. 1985 p 4 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

N86-20612# Southwest Research Inst., San Antonio, Tex.
BLAST PRESSURE MEASUREMENTS FOR THE FULL-SCALE GRAVEL GERTIE TEST
E. D. Esparza and W. E. Baker *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 549-580 (For primary document see N86-20589 11-31)
(AD-P004845) Avail: NTIS HC A99/MF E03 CSCL 19/4

N86-20912# Joint Publications Research Service, Arlington, Va.
RADIOMETRIC AIRBORNE MOISTURE METER
M. Gusev *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 34 Transl. into ENGLISH from Trud (Moscow, USSR), 19 Jul. 1985 p 4 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

N86-20913# Joint Publications Research Service, Arlington, Va.
THEORY OF FIELD PROPAGATION ADVANCES MHD PROBING OF EARTH'S CRUST
M. Savin *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 36-37 Transl. into ENGLISH from Izvestiya (Moscow, USSR), 11 Sep. 1985 p 3 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

N86-20917# Joint Publications Research Service, Arlington, Va.
EXPERIENCE WITH SURFACE IR SURVEY FOR ESTIMATING TEMPERATURE AND HEAT RADIATION OF THERMAL FIELDS OF MUTNOVSKIY VOLCANO (KAMCHATKA) Abstract Only
B. G. Polyak, B. A. Bezukh, V. I. Kaftan, A. I. Kuzmin, Yu. D. Kuzmin, V. Ye. Stelmashok, and V. P. Turkov *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 41-42 Transl. into ENGLISH from Vulkanologiya I Seysmologiya (Moscow, USSR), no. 3, May - Jun. 1985 p 54-63 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

N86-20929# Joint Publications Research Service, Arlington, Va.
ERROR IN METHOD FOR FLIGHT TESTS OF RADAR INSTRUMENTS FOR MEASURING ICE THICKNESS Abstract Only
V. V. Bogorodskiy and A. G. Oganesyan *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 53-54 Transl. into ENGLISH from Zhurnal Tekhnicheskoy Fiziki (Leningrad, USSR), v. 55, no. 6, Jun. 1985 p 1159-1162 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

36 LASERS AND MASERS

Includes parametric amplifiers.

N86-20775 Brown Univ., Providence, R. I.
SOME MODEL PROBLEMS IN THE LASER ENHANCED MCVD PROCESS Ph.D. Thesis
Chen-Yuan Wang 1985 125 p
Avail: Univ. Microfilms Order No. DA8519929

Combined free and forced laminar convection in horizontal and vertical tubes with external and volumetric heating were investigated. A continuum model of a two phase flow of submicron aerosol particles and a background gas is considered. An attempt is made to increase the deposition efficiency of the aerosol particles produced by the Modified Chemical Vapor Deposition (MCVD) process in the manufacture of optical fiber preforms. It is indicated that laser heating can significantly modify temperature gradients and the thermophoretic deposition of aerosol particles in the temperature field. In the vertical tube cases, buoyant heating plays a significant role in its effect on particle trajectories. Results using the Boussinesq approximation deviate significantly from those using the perfect gas law, even when laser heating is small. Such analysis may have an important bearing on methods employed in the fabrication of optical fiber preforms. Dissert. Abstr.

N86-20776# Los Alamos National Lab., N. Mex.
SCREENING AND SHIELDING EFFECTIVENESS OF AEROSOLS AGAINST LASER BEAMS: AN OPTIMIZATION STUDY
A. Zardecki and S. A. W. Gerstl May 1985 51 p refs
(Contract W-7405-eng-36)
(LA-10359-MS) Avail: NTIS HC A04/MF A01

The power of a laser beam delivered to a target through an aerosol screen is optimized in a three dimensional parameter space having as axes the real part of the refractive index, its imaginary part, and the mean particle size. On the basis of the small angle approximation, which applies to particles whose size is comparable

to or larger than the wavelength of the radiation, equations were set up describing the reduced and diffuse power of a beam propagating through a slab filled with scattering and absorbing aerosol particles. The scattering characteristics of a single particle are derived from Mie theory, and their dependence on the parameters in equation is investigated. The power transmittance is evaluated for real and imaginary parts of the refractive index ranging from 1 to 3 and from 0 to 2, respectively; the mean particle size for log-normally distributed particles is varied between 0.5 and 10.0 microns. A series of iso-valued surface plots of the delivered power allows design of an aerosol with desired screening or shielding effectiveness. Author

N86-20777*# National Aeronautics and Space Administration. Pasadena Office, Calif.
METHOD AND APPARATUS FOR ENHANCING LASER ABSORPTION SENSITIVITY Patent Application
Christopher R. Webster, inventor (to NASA) (JPL, Pasadena, Calif.) Filed 31 Jul. 1985 33 p
(Contract NAS7-918)
(NASA-Case-NPO-16567-1-CU; NAS 1.71:NPO-16567-1-CU; US-Patent-Appl-SN-760790) Avail: NTIS HC A03/MF A01 CSCL 20E

A simple optomechanical method and apparatus is described for substantially reducing the amplitude of unwanted multiple interference fringes which often limit the sensitivities of tunable laser absorption spectrometers. An exterior cavity is defined by partially transmissible surfaces such as a laser exit plate, a detector input, etc. That cavity is spoiled by placing an oscillating plate in the laser beam. For tunable diode laser spectroscopy in the mid-infrared region, a Brewster plate spoiler allows the harmonic detection of absorptances of $< .0001$ in a single laser scan. Improved operation is achieved without subtraction techniques, without complex laser frequency modulation and without distortion of the molecular lineshape signal. The technique is applicable to tunable lasers operating from UV to IR wavelengths and in spectrometers which employ either short or long pathlengths, including the use of retroreflectors or multipass cells. NASA

N86-20778*# National Aeronautics and Space Administration. Pasadena Office, Calif.
MULTIPLEX ELECTRIC DISCHARGE GAS LASER SYSTEM Patent Application
Thomas J. Pacala and James B. Laudenslager, inventors (to NASA) Filed 23 Oct. 1985 22 p
(Contract NAS7-100)
(NASA-Case-NPO-16433-1; NAS 1.71:NPO-16433-1; US-Patent-Appl-SN-790594) Avail: NTIS HC A02/MF A01 CSCL 20E

A multiple pulse electric discharge gas laser system is described in which a plurality of pulsed electric discharge gas lasers are supported in a common housing. Each laser is supplied with excitation pulses from a separate power supply. A controller, which may be a microprocessor, is connected to each power supply for controlling the application of excitation pulses to each laser so that the lasers can be fired simultaneously or in any desired sequence. The output light beams from the individual lasers may be combined or utilized independently, depending upon the desired application. The individual lasers may include multiple pairs of discharge electrodes with a separate power supply connected across each electrode pair so that multiple light output beams can be generated from a single laser tube and combined or utilized separately. NASA

N86-20779*# National Aeronautics and Space Administration. Pasadena Office, Calif.
METHOD AND MEANS FOR GENERATION OF TUNABLE LASER SIDEBANDS IN THE FAR-INFRARED REGION Patent Application
H. M. Pickett (JPL, Pasadena, Calif.) and J. Farhoomand, inventors (to NASA) (JPL, Pasdena, Calif.) Filed 3 Oct. 1985 13 p
(Contract NAS7-918)
(NASA-Case-NPO-16497-1-CU; NAS 1.71:NPO-16497-1-CU; US-Patent-Appl-SN-783887) Avail: NTIS HC A02/MF A01 CSCL 20E

A method for generating tunable far-infrared radiation is described. The apparatus includes a Schottky-barrier diode which has one side coupled through a conductor to a waveguide that carries a tunable microwave frequency, the diode has an opposite side which is coupled through a radiating whisker to a bias source. Infrared light is directed at the diode, and infrared light with tunable sidebands is radiated by the whisker through an open space to a reflector. The original infrared is separated from a tunable infrared sideband by a polarizing Michelson interferometer. NASA

N86-20780*# National Aeronautics and Space Administration. Pasadena Office, Calif.
MEANS FOR PHASE LOCKING THE OUTPUTS OF A SURFACE EMITTING LASER DIODE ARRAY Patent Application
James R. Lesh, inventor (to NASA) (JPL, Pasadena, Calif.) Filed 30 Sep. 1985 14 p
(Contract NAS7-918)
(NASA-Case-NPO-16542-1-CU; NAS 1.71:NPO-16542-1-CU; US-Patent-Appl-SN-781812) Avail: NTIS HC A02/MF A01 CSCL 20E

An array of diode lasers, either a two-dimensional array of surface emitting lasers, or a linear array of stripe lasers, is phase locked by a diode laser through a hologram which focuses the output of the diode laser into a set of distinct, spatially separated beams, each one foced onto the back facet of a separated diode laser of the array. The outputs of the diode lasers thus form an emitted coherent beam out of the front of the array. NASA

N86-20781*# Raytheon Co., Sudbury, Mass. Electro-Optics Systems Lab.
PULSED DOPPLER LIDAR AIRBORNE SCANNER Progress Report, Jan. - Sep. 1985
C. A. DiMarzio, D. B. McVicker, C. E. Morrow, and C. C. Negus 10 Oct. 1985 33 p
(Contract NAS8-33120)
(NASA-CR-178728; NAS 1.26:178728; ER85-4352; PR-35) Avail: NTIS HC A03/MF A01 CSCL 20E

This report covers the work accomplished during the reporting period on Pulsed Doppler Lidar Airborne Scanner and describes plans for the next reporting period. The objectives during the current phase of the contract are divided into four phases. Phase 1 includes ground testing of the system and analysis of data from the 1981 Severe Storms Test Flights. Phase 2 consists of preflight preparation and planning for the 1983 flight series. The flight test itself will be performed during Phase 3, and Phase 4 consists of post-flight analysis and operation of the system after that flight test. The range profile from five samples taken during Flight 10, around 1700 Z is given. The lowest curve is taken from data collected upwind of Mt. Shasta at about 10,000 feet of altitude, in a clear atmosphere, where no signals were observed. It thus is a good representation of the noise level as a function of range. The next curve was taken downwind of the mountain, and shows evidence of atmospheric returns. There is some question as to whether the data are valid at all ranges, or some ranges are contaminated by the others. Author

N86-20782*# Spectra Technology, Inc., Bellevue, Wash.
WINDVAN LASER STUDY Final Report
13 Sep. 1985 105 p refs
(Contract NAS8-36644)
(NASA-CR-178687; NAS 1.26:178687) Avail: NTIS HC A06/MF A01 CSCL 02E

The goal of defining a CO2 laser transmitter approach suited to Shuttle Coherent Atmospheric Lidar Experiment (SCALE) requirements is discussed. The adaptation of the existing WINDVAN system to the shuttle environment is addressed. The size, weight, reliability, and efficiency of the existing WINDVAN system are largely compatible with SCALE requirements. Repacking is needed for compatibility with vacuum and thermal environments. Changes are required to ensure survival through launch and landing, mechanical, vibration, and acoustic loads. Existing WINDVAN

thermal management approaches depending on convection need to be upgraded zero gravity operations. B.G.

N86-20783# Department of the Army, Washington, D. C.
MULTIPLE PARALLEL RF EXCITED CO2 LASERS Patent Application
P. P. Chenauski, L. N. Laughman, and E. H. Drinkwater, inventors (to Army) Filed 12 Aug. 1985 18 p
(AD-D011859; US-Patent-Appl-SN-761256) Avail: NTIS HC A02/MF A01 CSCL 20/5

Dual waveguide lasers which are transversely excited in parallel from a common source of radio frequency are provided with one or more channels or bores connecting the laser cavities. The dimensions and configuration of the connecting channels are chosen so that the electric field from the applied RF excitation source will be higher in the connecting channels than in either of the paralleled waveguide gas discharge cavities, or that the electron collision loss to the nearby ceramic and metallic walls will be lower in the connecting channels than in the aforementioned waveguide cavities. The initial gas breakdown is thus made to preferentially occur in the connecting channels and thus force initiation of both laser cavities simultaneously. GRA

N86-20784# Materials Research Labs., Ascot Vale (Australia).
INVESTIGATION OF COLLISION-INDUCED FLUORESCENCE IN D2:Ar AND D2:HD:Ar MIXTURES AT 200 k
R. C. McLeary and D. P. Juchnevicius Jul. 1985 15 p
(AD-A161545; MRL-R-967) Avail: NTIS HC A02/MF A01 CSCL 07/4

The collision-induced fundamental-band fluorescence from vibrationally-excited D2 in high-pressure mixtures of D2 and Ar and D2, HD and Ar has been investigated. Fluorescence intensity and vibrational lifetime have been measured at 200 K as a function of pressure and mixture ratio. The results indicate that a D2:HD:Ar mixture at reduced temperature is an attractive candidate medium for an optically-pumped collision-induced-dipole laser. GRA

N86-20785# Pacific Northwest Lab., Richland, Wash.
HIGH-RESOLUTION CW RESONANCE IONIZATION MASS SPECTROMETRY
T. J. Whitaker, B. D. Cannon, and B. A. Bushaw Sep. 1985 7 p refs Presented at the 28th Oak Ridge National Laboratory Conference on Analytical Chemistry, Knoxville, Tenn., 1 Oct. 1985
(Contract DE-AC06-76RL-01830)
(DE86-001674; PNL-SA-13253; CONF-8510151-10) Avail: NTIS HC A02/MF A01

We have used continuous-wave (CW) lasers to produce efficient, isotopically selective ionization of barium in the source region of a quadrupole mass spectrometer. The technique involves two low-power, high-resolution dye lasers for the resonance steps and a 100 watt CW Nd:YAG laser for photoionization. The use of CW lasers offers both better duty cycle and much better resolution than is possible with pulsed lasers. We have observed an isotopic selectivity of 800 between (137)Ba and (138)Ba in the CW resonance process. Ionization efficiency is estimated to be about 10(-4) and simple improvements should improve this value to near unity. DOE

N86-20786# Sandia National Labs., Albuquerque, N. Mex.
Nd:YAG LASER WELDING EXPERIMENTS
R. L. Akau, D. M. Keicher, P. W. Fuerschbach, and T. J. Lienert 1 Oct. 1985 18 p Presented at the Laser Welding and Laser Surface Treatment Clinic, Detroit, Mich., 29 Oct. 1985
(Contract DE-AC04-76DP-00789)
(DE86-000863; SAND-85-1523C; CONF-8510170-1) Avail: NTIS HC A02/MF A01

Laser-beam/plume interaction experiments were conducted with a pulsed Nd:YAG laser. Tests were done on four different metals: Aluminum 1100, Molybdenum, Nickel 200, and Stainless Steel 304. Previous laser welding experiments have indicated that the vapor plume ejected from the irradiated base material significantly attenuates the laser beam energy for Nickel 200 and Stainless Steel 304. To substantiate this observation, the plume was subjected to a cross flow of argon gas. Metallurgical studies showed a significant increase in weld penetration for all materials except for Aluminum. These experiments also indicated that the plume ejects normal to the base material. Thus, the specimen was tilted at different angles in an attempt to reduce laser beam attenuation. Results showed no significant increase in weld depth when the tilt angle was increased. Mass loss measurements were also performed and the experimental data were an order-of-magnitude less than those predicted by a numerical laser welding code. DOE

N86-20787# European Space Agency, Paris (France).
DEVELOPMENT OF A THEORETICAL MODEL TO DESCRIBE THE INTERACTION PHENOMENA BETWEEN ELECTRIC DISCHARGE AND SUPERSONIC FLOW OF A PULSED CO LASER
Holger Jacoby Aug. 1985 116 p refs Transl. into ENGLISH of "Entwicklung eines theoretischen Modells zur Beschreibung der Wechselwirkung zwischen elektrischer Entladung u. Ueberschallstroemung eines gepulsten CO-Lasers' Rept. DFVLR-FB-84-45 Stuttgart, West Germany, Dec. 1984 Original report in GERMAN previously announced as ESA-94453
(ESA-TT-913; DFVLR-FB-84-45) Avail: NTIS HC A06/MF A01; original German version available from DFVLR, Cologne DM 34

A theoretical model to describe the interaction phenomena of heat release in a supersonic flow was developed. It based on a finite difference method, reliability is proved by analytical and numerical tests. For the case of a pulsed electric discharge in a Mach 3 flow the formation and propagation of density perturbations are investigated and results are presented for different energy distributions within the discharge volume. The repetition frequency of pulsed lasers can be exactly determined by calculating the clear-time of the flow. The applicability of the model to the description of other laser types is shown. Author (ESA)

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N86-20788* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DAMPING SEAL FOR TURBOMACHINERY Patent
George L. vonPragenau, inventor (to NASA) Issued 8 Oct. 1985 5 p Filed 18 Jan. 1985
(NASA-Case-MFS-25842-2; US-Patent-4,545,586;
US-Patent-Appl-SN-692875; US-Patent-Class-277-53;
US-Patent-Class-415-174) Avail: US Patent and Trademark Office CSCL 11A

A damping seal between a high speed rotor member and stator member that separates pressurized fluid compartments is described. It is characterized by the rotor member having a smooth outer surface and the stator member having its bore surface roughened by a plurality of pockets or depressions.
Official Gazette of the U.S. Patent and Trademark Office

N86-20789* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SELF-LOCKING TELESCOPING MANIPULATOR ARM Patent
Malcolm F. Nesmith, inventor (to NASA) Issued 15 Oct. 1985 8 p Filed 30 Sep. 1983
(NASA-Case-MFS-25906-1; US-Patent-4,547,121;
US-Patent-Appl-SN-537757; US-Patent-Class-414-753;
US-Patent-Class-901-31; US-Patent-Class-901-25;
US-Patent-Class-414-718; US-Patent-Class-414-4;
US-Patent-Class-212-230) Avail: US Patent and Trademark Office CSCL 13I

A telescoping manipulator arm and pivotable finger assembly are disclosed. The telescoping arm assembly includes a generally T-shaped arm having three outwardly extending fingers guided on grooved roller guides to compensate for environmental variations. The pivotable finger assembly includes four pivoting fingers. Arcuate

teeth are formed on the ends of the fingers. A rack having teeth on four sides meshes with each one of the fingers. One surface of the rack includes teeth along its entire surface which mesh with teeth of one of the fingers. The teeth at the remote end of the rack engage teeth of a gear wheel. The wheel includes a worm which meshes with a worn drive shaft of the drive motor providing a ninety degree self-locking drive for locking the fingers in a desired position. A similar drive provides a self-locking drive for positioning the telescoping arm.
Official Gazette of the U.S. Patent and Trakemark Office

N86-20790 United Kingdom Atomic Energy Authority, Risley (England).
PROPERTIES OF TYPE 1811 CrNi ss AND PARENT-LIKE WELD JOINTS WITH REGARD TO APPLICATION IN THE HIGH TEMPERATURE FIELD
E. D. Grosser, E. teHeesen, and H. Lorenz 16 Dec. 1985 18 p refs Transl. into ENGLISH of conference paper "Eigenschaften des Stahles X6 CrNi 1811 und Artgleicher Schweissverbindungen unter Beruecksichtigung des Einsatzes im Hochtemperaturgebiet" presented at the 2nd International Colloquium on Welding in Nuclear Engineering, West Germany, 1974 p 187-194 Colloquium held in Dusseldorf, West Germany, 23-24 Oct. 1974
(BLL-Risley-Tr-5230-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.

Since 1969 the unstabilized austenitic steel X 6 CrNi 1811 was used in Germany for applications in the high temperature range. In cases where it was used, this steel has confirmed the positive experienced gained aboard with the comparable type AISI 304 ss with regard to processing, welding behavior, and mechanical parameters. The differences in mechanical behavior of the basic material and the welded joints, caused by the low content of delta ferrite, should be taken into account in special applications. The adoption of American design specifications applicable in Germany for the high temperature fields makes extended investigations essential, both for the basic material and especially for welded joints with regard to fatigue behavior. B.G.

N86-20791 British Library Lending Div., Boston Spa (England).
EXTENDING THE FIELD OF USE FOR ROPES WITH THREE STRAND METAL CORES
Yu. M. Shapranov, V. P. Rudakov, and I. N. Razborshchikov [1986] 7 p refs Transl. into ENGLISH from Sizd. (USSR), no. 5, 1955 6 p
(BLLD-Trans-M-36506-(5828.4)) Avail: British Library Lending Div., Boston Spa, England

The use of a 3 x 7 (1+6) + 3 metal core for hoisting wire LK-3 rope, instead of organic material, is discussed. The new design metal core is 15 to 20% more efficient than wire ropes with the standard 7x7 (1+6) metal core design. B.G.

N86-20792 British Library Lending Div., Boston Spa (England).
PROCEDURE FOR SELECTING OPTIMAL TEMPERATURE AND SPEED CONDITIONS FOR PRESSURE WELDING
G. Ya. Gun, N. V. Biba, and O. P. Buzina 1985 4 p refs Transl. into ENGLISH from Iz. VUZ Chernaya Metall. (USSR), no. 5, 1985 3 p
(BLLD-Trans-M-36528-(5828.4)) Avail: British Library Lending Div., Bston Spa, England

The procedure for selecting optimal temperature and speed conditions for pressure welding is described. Author

N86-20793 Cornell Univ., Ithaca, N.Y.
NONLINEAR ANALYSIS OF SQUEEZE FILM DAMPER SYSTEMS Ph.D. Thesis
Xuehai Li 1985 117 p
Avail: Univ. Microfilms Order No. DA8516935

A squeeze film damper system with centering spring is investigated for both rigid rotor and flexible rotor models. Under the existence of small gravitational residual which comes from the imperfect balance of preloading springs and gravitational force, a perturbation method is applied to the problem, and analytical solutions are obtained. A thorough study of the steady state behavior of the system with synchronous motion is performed. Two perturbation solutions are developed: one for large speed and one for small speed. The perturbation solutions are in good agreement with the previous experimental results and present numerical simulation. Besides the synchronous motion there exist nonsynchronous motions for the system. The existence conditions for the phenomenon are revealed, the degree of nonlinearity fluid film force associated with phenomenon is explored, and some other related factors are studied, as well. Effort is made on the global analysis of the topological structures of the system. Though the squeeze film damper system is an inherently stable system, undesirable responses could occur for wide range of parameters and initial conditions. Dissert. Abstr.

N86-20794 Wisconsin Univ., Madison.
INVESTIGATION OF THE INFLUENCE OF GEAR SYSTEM PARAMETERS ON NOISE GENERATION Ph.D. Thesis
Indera Nurhadi 1985 224 p
Avail: Univ. Microfilms Order No. DA8512321

A procedure, based on a displacement based finite element method, or investigating noise generation, transmission and radiation from idealized gear systems was developed. The systems under investigation are modeled as acoustic-structure interaction problems. The procedure incorporates an efficient time integration method suitable for calculating the dynamic time response. Examples of simulation of the interaction of a pair of gear teeth and investigation of the acoustic field inside and outside a gear box are presented. Dissert. Abstr.

N86-20795 Alabama Univ., Huntsville.
A VISCOELASTIC/DAMAGE SIMULATION MODEL FOR FILAMENT-WOUND CYLINDRICAL PRESSURE VESSELS Ph.D. Thesis
Johnny Lawrence Prater 1985 84 p
Avail: Univ. Microfilms Order No. DA8519066

A model to predict the viscoelastic/damage response of a filament wound composite cylindrical pressure vessel to a proof test loading is developed. The matrix material of the composite system is assumed to be isotropic and linearly viscoelastic. A damage model is proposed which produces a quadratic relationship between the transverse modulus and the circumferential strains. A nonlinear model results and is solved by iterative solution based on the damaged response. The elastic/viscoelastic correspondence principle is used to produce, in the Laplace domain, an associated elastic solution for the circumferential strains. The associated elastic solution is inverted by using the method of collocation to yield the time dependent circumferential strain. A numerical example to demonstrate the simulation model is included. A proof test loading of 5.5 MPa is applied for one minute. Results indicate that the damage is modeled reduces the instantaneous failure load from 9.977 MPa to 7.771 MPa, or 22%. Dissert. Abstr.

N86-20796 Department of the Air Force, Washington, D.C.
INERT ATMOSPHERE TRANSFER VESSEL Patent
Joseph T. Maloy, John F. Leonard, and David H. Fritts, inventors (to Air Force) Issued 15 Oct. 1985 5 p Supersedes AD-D011433
(AD-D011952; US-Patent-4,546,897; US-Patent-Appl-SN-657100; US-Patent-Class-220-227) Avail: US Patent and Trademark Office CSCL 13/4

This patent describes a novel hermetically sealed, protective atmosphere transfer vessel which comprises a container defining an interior cavity and opening thereof for receiving a sample to be protected during transfer, an annular lip surrounding the opening for receiving a flexible puncturable membrane sealing the container, and a wire puncture bridge attached at one to the container and having at the other end a point positioned near the membrane whereby pressure internal of the container expands the membrane against the point to puncture and tear away the membrane for exposure of the sample. An alternative embodiment includes a lid for the container including an axial exhaust hole therethrough and a ball valve for sealing the exhaust hole under the influence of external pressure on the lid. GRA

N86-20797*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SEGMENTED TUBULAR CUSHION SPRINGS AND SPRING ASSEMBLY Patent Application
Leonard A. Haslim, inventor (to NASA) Filed 18 Jun. 1985 39 p (NASA-Case-ARC-11349-1; NAS 1.71:ARC-11349-1; US-Patent-Appl-SN-746160) Avail: NTIS HC A03/MF A01 CSCL 13E

A spring which includes a tube with an elliptical cross section, with the greater axial dimension extending laterally and the lesser axial dimension extending vertically is disclosed. A plurality of cuts in the form of slots passing through most of a wall of the tube extend perpendiculary to a longitudinal axis extending along the tube. An uncut portion of the tube wall extends along the tube for bonding or fastening the tube to a suitable base, such as a bottom of a seat cushion. NASA

N86-20798*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CURE-IN-PLACE COMPOSITE FASTENER
Gary L. Farley (Department of the Army, Washington, D.C.) and William T. Freeman, Jr., inventors (to NASA) 25 Jun. 1985 11 p (NASA-Case-LAR-12939-1; NAS 1.71:LAR-12939-1; US-Patent-Appl-SN-748532) Avail: NTIS HC A02/MF A01 CSCL 13E

The cure-in-place composite fastener embodies a method and apparatus to fasten composite components in laminate structures. At least one single or multipiece metal or fibrous cure-in-place fastener is inserted into and through at least two layers of partially cured composite material possing diverse curing properties. In the simplest case, a laminate structure is comprised of a layer which cures to a skin layer. The fastener is inserted into a flush with the surface of layer and held in place in laminate structure as the tapered ends are bent against a mold after fastener is inserted through laminate structure. When the laminate structure is completely cured with the fastener in place, the epoxy matrix of the layer flows around and over the fastener thereby making the surface of the layer a smooth surface free from cut fibers or abrubt discontinuities. NASA

N86-20799*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DEPLOYABLE M-BRACED TRUSS STRUCTURE Patent Application
Martin M. Mikulas, Jr. and Marvin D. Rhodes, inventors (to NASA) Filed 30 Jul. 1985 12 p
(NASA-Case-LAR-13081-1; NAS 1.71:LAR-13081-1; US-Patent-Appl-SN-760378) Avail: NTIS HC A02/MF A01 CSCL 13I

A deployable M-braced truss structure, efficiently packaged into a compact stowed position and expandable to an operative position at the use site is described. The M-braced configuration effectively separates tension compression and shear in the structure and permits efficient structural design. Both diagonals and longerons telescope from an M-braced base unit and deployed either pneumatically, mechanically by springs or cables, or by powered reciprocating mechanisms. Upon full deployment, the diagonals and longerons lock into place with a simple latch mechanism. NASA

N86-20800*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ADVANCED VAPOR SUPPLY MANIFOLD Patent Application
Ivan O. Clark, William J. Debnam, Jr., Archibald L. Fripp, Jr., and Roger K. Crouch, inventors (to NASA) Filed 15 Jul. 1985 14 p (NASA-Case-LAR-13259-1; NAS 1.71:LAR-13259-1; US-Patent-Appl-SN-754706) Avail: NTIS HC A02/MF A01 CSCL 13I

A four-port vapor supply valve to control a vapor or fluid supply to a vapor growth manifold that eliminates supply source contamination from back diffusion into the supply vapor container is disclosed. This valve greatly improves the ability to sharply add or terminate supply flow to the main manifold line. The valve is comprised of a housing with four ports. Two of the ports disposed on opposite sides of the housing are for ingress and egress of the main manifold line. The other two opposing ports are for supply input and purge outlet. The supply/purge line and main manifold line form an X when the supply valve is open and two separate lines when the valve is closed. A single valve stem plunger and seal seat against the main manifold valve inlet seat in the closed position while supply vapor flow is full intensity behind the closed valve seal flowing into the purge line. When the plunger is raised opening access to the main manifold line simultaneously with closing the purge line valve supply flow is routed directly into the manifold line arriving quickly and full strength. Closing the valve by lowering the valve stem plunger seals the main manifold line and terminates supply flow without bleed down time, thus, a staccato supply on/off is provided. NASA

N86-20801*# National Aeronautics and Space Administration. Pasadena Office, Calif.
SELF-LOCKING DOUBLE RETENTION REDUNDANT FULL PIN RELEASE Patent Application
Thomas O. Killgrove, inventor (to NASA) (JPL, Pasadena, Calif.) Filed 18 Mar. 1985 12 p
(Contract NAS7-100)
(NASA-Case-NPO-16233-1; NAS 1.71:NPO-16233-1; US-Patent-Appl-SN-737018) Avail: NTIS HC A02/MF A01 CSCL 13E

A double retention redundant pull pin release system is disclosed. The system responds to a single pull during an intentional release operation. A spiral threaded main pin is seated in a mating bore in a housing, which main pin has a flange fastened thereon at the part of the main pin which is exterior to the housing. Accidental release tends to rotate the main pin. A secondary pin passes through a slightly oversized opening in the flange and is seated in a second bore in the housing. The pins counteract against one another to prevent accidential release. A frictional lock is shared between the main and secondary pins to enhance further locking of the system. The secondary pin, in response to a first pull, is fully retracted from its bore and flange hole. Thereafter the pull causes the main pin to rotate free of the housing to release, for example, a parachute mechanism. NASA

N86-20802*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
METHOD OF REPAIRING HIDDEN LEAKS IN TUBES Patent Application
Joseph D. Duesburg (Rockwell International Corp., Pittsburgh, Pa.) and Robert C. Mills, inventors (to NASA) (Rockwell International Corp., Pittsburgh, Pa.) Filed 30 Aug. 1985 11 p Sponsored by NASA
(NASA-CASE-MFS-19796-1; NAS 1.71:MFS-19796-1; US-Patent-Appl-SN-770920) Avail: NTIS HC A02/MF A01 CSCL 13I

A method of repairing a tubular assembly in which access to a defect in the tube is limited includes the steps of cutting an opening in the tube on the side opposite the defect so as to expose the defect from the inside of the tube. A tubular insert is inserted into the tube to cover the defect and is secured in place by means of brazing or welding. The remaining space between the opening and insert is closed by means of close-out patches which are welded or brazed to both the insert and the tube. The result is a permanent repair having great structural integrity. NASA

N86-20803*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SUN SHIELD Patent Application
Arthur Frank, Silvio F. DeRespinis, and John Mockovciak, Jr., inventors (to NASA) Filed 12 Aug. 1985 12 p Prepared in cooperation with Grumann Aerospace Corp., Bethpage, N.Y.
(NASA-Case-MSC-20162-1; NAS 1.71:MSC-20162-1; US-Patent-Appl-SN-764805) Avail: NTIS HC A02/MF A01 CSCL 13I

A shading device which is capable of compactly storing a flexible shade on a biased, window-shade type spring roller and

controlled to deliver the shade selectively to either its operative shading or compact storage orientation. NASA

N86-20804*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RADIAL AND TORSIONALLY CONTROLLED MAGNETIC BEARING Patent Application
Phillip A. Studer, inventor (to NASA) Filed 21 Nov. 1985 23 p
(NASA-Case-GSC-12957-1; NAS 1.71:GSC-12957-1;
US-Patent-Appl-SN-800193) Avail: NTIS HC A02/MF A01 CSCL 13I

A magnetic bearing including a circular stator member with a plurality of circumferential pole faces and a suspended annular ring member with corresponding number of inward facing circumferential pole faces separated by respective air gaps is presented. A source of DC magnetic flux circulates flux between the circumferential pole faces of the stator and the ring to provide axial stability along a central longitudinal axis. Flux coil means are included on the stator member to provide variable flux density along predetermined radial paths to provide active radial stabilization. Flux coil means are included on the stator to actively modulate the magnitude of the magnetic forces as well as their direction by differential flux control involving the DC magnetic flux to produce torquing moments about a pair of mutually orthogonal axes which are perpendicular to the central axis. NASA

N86-20805*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THERMAL-STRESS-FREE FASTENERS Patent Application
Max L. Blosser, Robert McWithey, and Thomas F. Kearns, inventors (to NASA) (Inst. for Defense Analysis, Alexandria, Va.) Filed 18 Dec. 1984 11 p
(NASA-Case-LAR-13325-1-SB; NAS 1.71:LAR-13325-1-SB;
US-Patent-Appl-SN-683110) Avail: NTIS HC A02/MF A01 CSCL 13E

A fastener used for connecting two or more structural elements together where the fastener and structural elements have substantially different coefficients of thermal expansion is described. The fastener head or load bearing surface is shaped according to a thermal expansion equation to form a rounded concial shape. This shape allows the fastener to maintain snug contact with the structural elements and at the same time, prevents the buildup of stresses due to thermal expansion. As a result the fastener and structural elements can be exposed to severe temperature cycles while maintaining a stress free snug fit. Particular shaping of the conical portion of the invention permits the use of specially orthotropic structural materials. NASA

N86-20806*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FLEXIBLE DIAPHRAGM: EXTREME TEMPERATURE USAGE Patent Application
Guillermo Lerma, inventor (to NASA) Filed 7 Nov. 1985 15 p
(NASA-Case-MSC-20797-1; NAS 1.71:MSC-20797-1;
US-Patent-Appl-SN-771537) Avail: NTIS HC A02/MF A01 CSCL 13I

A diaphragm suitable for extreme temperature usage, such as encountered in critical aerospace applications, is fabricated by a unique method, and of a unique combination of materials, which include multilayered lay-ups of diaphragm materials sandwiched between layers of bleeder fabric which, after being formed in the desired shape on a mold, are vacuum sealed and then cured under pressure, in a heated autoclave, to produce a bond capable of withstanding extreme temperatures. NASA

N86-20807*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SELF-CONTAINED, SINGLE-USE HOSE AND TUBING CLEANING MODULE Patent Application
Fred Patrick Rollins (Lockheed Engineering and Management Services Co., Inc., Houston, Tex.) and James Steven Glass, inventors to NASA (Lockheed Engineering and Management Services Co., Inc., Houston, Tex.) Filed 3 Oct. 1985 16 p
(NASA-Case-MSC-20857-1; NAS 1.71:MSC-20857;
US-Patent-Appl-SN-783886) Avail: NTIS HC A02/MF A01 CSCL 13I

A self-contained, single-use hose and tubing cleaning module which utilizes available water supplies without requiring access to precision cleaning facilities is presented. The module is attached to the water source at the inlet side and to the hose or tubing to be cleaned at the outlet side. The water flows through a water purification zone, a detergent dispensing zone a filtration zone before the detergent-laden water flows into the tubing to clean the tubing walls. The module contains an embedded pad which is impregnated with a pH indicator to indicate to the user when the detergent has dissolved and rinsing of the tubing begins. NASA

N86-20808*# General Motors Corp., Indianapolis, Ind. Allison Gas Turbine Div.
ADVANCED GAS TURBINE (AGT) TECHNOLOGY REPORT Annual Report, Jan. - Dec. 1984
Jun. 1985 139 p
(Contracts DEN3-168; DE-AI01-77CS-51040)
(NASA-CR-175018; DOE/NASA/0168-9; NAS 1.26:175018;
EDR-12070) Avail: NTIS HC A07/MF A01 CSCL 21A

Engine testing, ceramic component fabrication and evaluation, component performance rig testing, and producibility experiments at Pontiac comprised AGT 100 activities of this period, January to December 1984. Two experimental engines were available and allowed the evaluation of eight experimental assemblies. Operating time accumulated was 115 hr of burning and 156 hr total. Total cumulative engine operating time is now 225 hr. Build number 11 and 12 of engine S/N 1 totaled 28 burning hours and constituted a single assembly of the engine core--the compressor, both turbines, and the gearbox. Build number 11 of engine S/N 1 included a 1:07 hr continuous test at 100% gasifier speed (86,000 rpm). Build number 8 of engine S/N 2 was the first engine test with a ceramic turbine rotor. A mechanical loss test of an engine assembly revealed the actual losses to be near the original design allowance. Component development activity included rig testing of the compressor, combustor, and regenerator. Compressor testing was initiated on a rig modified to control the transfer of heat between flow path, lubricating oil, and structure. Results show successful thermal decoupling of the rig and lubricating/cooling oil. Rig evaluation of a reduced-friction compressor was initiated. Combustor testing covered qualification of ceramic parts for engine use, mapping of operating range limits, and evaluation of a relocated igniter plug. Several seal refinements were tested on the hot regenerator rig. An alternate regenerator disk, extruded MAS, was examined and found to be currently inadequate for the AGT 100 application. Also, a new technique for measuring leakage was explored on the regenerator rig. Ceramic component activity has focused on the development of state-of-the-art material strength characteristics in full-scale hardware. Injection-molded sintered alpha-SiC rotors were produced at Carborundum in an extensive process and tool optimization study. Author

N86-20809*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ADHESION AND WEAR RESISTANCE OF MATERIALS
Donald H. Buckley 1986 30 p refs Proposed for presentation at the Hartstoffschichten zur Verschleissminderung, Bad Honnef, West Germany, 5-7 May 1986; sponsored by max-Planck-Inst. fuer Metallforschung
(NASA-TM-87239; E-2914; NAS 1.15:87239) Avail: NTIS HC A03/MF A01 CSCL 11H

Recent studies into the nature of bonding at the interface between two solids in contact or a solid and deposited film have provided a better understanding of those properties important to the adhesive wear resistance of materials. Analytical and experimental progress are reviewed. For simple metal systems the adhesive bond forces are related to electronic wave function overlap. With metals in contact with nonmetals, molecular-orbital energy, and density of states, respectively can provide insight into adhesion and wear. Experimental results are presented which correlate adhesive forces measured between solids and the

electronic surface structures. Orientation, surface reconstruction, surface segregation, adsorption are all shown to influence adhesive interfacial strength. The interrelationship between adhesion and the wear of the various materials as well as the life of coatings applied to substrates are discussed. Metallic systems addressed include simple metals and alloys and these materials in contact with themselves, both oxide and nonoxide ceramics, diamond, polymers, and inorganic coating compounds, h as diamondlike carbon. Author

N86-20810# National Aerospace Lab., Tokyo (Japan).
THE PERFORMANCE OF A CRYOGENIC PUMP FOR THE TWO-PHASE FLOW CONDITION
Hitoshi Yamada, Mitsuo Watanabe, Satoshi Hasegawa, and Kenjiro Kamijio 1985 12 p refs In JAPANESE; ENGLISH summary
(NAL-TR-870; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

An experimental investigation was carried out in order to obtain the performance characteristics of a cryogenic pump under a two-phase flow condition. The experiment used an oxygen pump with an inducer and liquid nitrogen as the test fluid. The vapor volumetric fraction at the pump inlet was calculated with an assumption of a constant enthalpy process across an orifice which was used to generate the two-phase flow at the pump inlet. The results showed at the pump head rise did hardly decrease even when the vapor fraction became about 40 percent at the pump inlet. The two-phase flow at the pump inlet was confirmed by a visual observation through a transparent plastic section. It was also found that the adiabatic efficiency for the two-phase flow provided a good agreement with the pump efficiency, which was determined by using torques, outlet flow rates and the pressure difference between the pump inlet and outlet. Author

N86-20811# Army Military Personnel Center, Alexandria, Va.
ANALYSIS OF THE DYNAMICS AND CONTROL OF A TWO DEGREE OF FREEDOM ROBOTIC MANIPULATOR MOUNTED ON A MOVING BASE Final Report
R. Lynch 18 Oct. 1985 121 p
(AD-A160672) Avail: NTIS HC A06/MF A01 CSCL 05/8

Mounting robotic manipulators on moving bases offers the potential of greatly extending the manipulator applications. However, the motion of the base creates a number of problems in terms of the control of the manipulator. The base motion subjects the manipulator to large scale disturbances that can seriously degrade system performance. This thesis illustrates the problems associated with a moving base as it applies to a two degree of freedom manipulator. It is shown that conventional control techniques, such as PID control, cannot effectively compensate for the base accelerations in a typical application. It is also shown that more advanced control algorithms, including decoupling control, LQR control, and pole placement prove to be ineffective to varying degrees. The linear controller that placement technique, is then applied to the complete nonlinear system in an attempt to investigate the influence of the base motion over the entire range of motion of the manipulator. Recommendations for possible solutions to the moving base problem, along with recommendations for extensions of this work, are then made. GRA

N86-20812# Rutgers - The State Univ., New Brunswick, N. J. Dept. of Mechanical, Industrial and Aerospace Engineering.
A THERMODYNAMIC SYSTEM ANALYSIS MODEL OF A DIESEL ENGINE Final Report, 1 Aug. 1984 - 31 Jul. 1985
K. T. Rhee, X. L. Yang, and S. L. Chang 16 Oct. 1985 121 p
(Contract DAAG29-84-K-0158)
(AD-A161433; ARO-21770.4-EG) Avail: NTIS HC A06/MF A01 CSCL 21/7

A thermodynamic system model of a direct injection-type diesel engine has been developed. The objective of the modeling was to enable predictions of the instantaneous temperature distribution along and into the combustion chamber of a diesel engine. The present model has a main emphasis on the heat transfer computation with inclusion of new submodels of conduction, radiation heat transfer of the engine, plus engine energy conversion processes. The development of submodels of space-resolved heat release and species distribution in the global model was not possible during the period of the present contract (1 August, 1984 - 31 July, 1985). Consequently, some assumptions were employed for replacing the said submodels in the selected sample computations based on some of the reported results on heat release and heat transfer rates made available in literature. Some results obtained from the present computational study are included in the report and the usefulness of the new computer program for the actual engine design is suggested herein. In addition, recommendation for improvement of the present computational model is included. Author (GRA)

N86-20813*# Naval Postgraduate School, Monterey, Calif.
PROCEEDINGS OF THE 1985 ONR/NAVAIR WAVE ROTOR RESEARCH AND TECHNOLOGY WORKSHOP Final Report, 1 Jan. - 31 Mar. 1985
R. P. Shreeve and A. Mathur May 1985 425 p Workshop held in Monterey, Calif., 26-27 Mar. 1985
(RR0-2403)
(AD-A161539; NPS67-85-008) Avail: NTIS HC A18/MF A01 CSCL 21/5

The purpose of this workshop was to bring together an international group who are, or who have been, involved in research studies or applications of gas-gas, or gas-shaft, energy exchange through wave propagation in rotor passages. It is intended that the workshop serve to define the current levels of understanding, capability and interest in the field, and to provide the input necessary for an assessment of the prospects for the useful exploitation of wave rotors in gas turbine engines. GRA

N86-20814# Mechanical Technology, Inc., Latham, N. Y.
FREE-PISTON STIRLING ENGINE DIAPHRAGM-COUPLED HEAT-ACTUATED HEAT PUMP COMPONENT TECHNOLOGY PROGRAM Final Report
Jun. 1985 179 p
(Contract DE-AC05-84OR-21400)
(DE86-001463; ORNL/SUB-80-61618/1) Avail: NTIS HC A09/MF A01

The results of an effort to develop and demonstrate the technical feasibility of a residential size Stirling engine driven, diaphragm coupled compressor for a heat pump application are presented. The module was to consist of a free piston resonant engine capable of producing 3 kW of useable power, a low loss hydraulic transmission and a nominal 3 ton refrigerant-22 reciprocating compressor. Presented are details of analysis predicted performance goals, design, development of hardware, component testing, and engine/compressor breadboard testing. The test results demonstrated the mechanical feasibility and operational stability of the design concept. The assembly did not stroke out to achieve the full capacity levels predicted, however, and a follow on phase IA was initiated in which the reasons for the short fall will be determined. Details of phase IA are included in the appendix. In general, it was concluded that losses in the hydraulic transmission were excessive to the point where insufficient power was available to the compressor to satisfy its driving requirements at the design point conditions. Future work is recommended to reduce the transmission losses so that full capacity can be achieved. DOE

N86-20815# Oak Ridge National Lab., Tenn.
GAS TUNGSTEN ARC AND SHIELDED METAL ARC WELDING OF CHROMIUM-NICKEL STEEL. WELDING PROCEDURE SPECIFICATION
C. H. Wodtke, D. R. Frizzell, and W. A. Plunkett Aug. 1985 25 p
(Contract DE-AC05-84OR-21400)
(DE86-001500; ORNL/M-14) Avail: NTIS HC A02/MF A01

Procedure WPS-303-ASME-3 is qualified under Section IX of the ASME Boiler and Pressure Vessel Code for gas tungsten arc and shielded metal arc welding of 300 Series Cr-Ni steels (P-8-1), in thickness range 0.25 to 2 in. The filler metals are ER3XX (F-6, A-8) (GTAW) and E3XX-15 (F-5, A-8). The shielding gas for GTAW is argon. DOE

N86-20816# Oak Ridge National Lab., Tenn.
SEMIAUTOMATIC GAS METAL ARC WELDING OF 6XXX ALUMINUM. WELDING PROCEDURE SPECIFICATION
C. H. Wodtke, D. R. Frizzell, and W. A. Plunkett Aug. 1985 7 p
(Contract DE-AC05-84OR-21400)
(DE86-001513; ORNL/M-27) Avail: NTIS HC A02/MF A01

Precedure WPS-1015 is qualified under Section IX of the ASME Boiler and Pressure Vessel Code for semiautomatic gas metal arc welding of aluminum alloys 6061 and 6063 (P-23), in thickness 0.187 to 2.0 in. The filler metal is ER4043 (F-23). The shielding gas is argon. DOE

N86-20817# Oak Ridge National Lab., Tenn.
GAS TUNGSTEN ARC WELDING OF NICKEL. WELDING PROCEDURE SPECIFICATION
C. H. Wodtke, D. R. Frizzell, and W. A. Plunkett Aug. 1985 13 p
(Contract DE-AC05-84OR-21400)
(DE86-001515; ORNL/M-29) Avail: NTIS HC A02/MF A01

Procedure WPS-1301-ASME-4 is qualified under Section IX of the ASME Boiler and Pressure Vessel Code for gas tungsten arc welding of nickel N02200 and N02201 (P-41), in thickness range 0.035 to 0.432 in.; filler metal is ERNi-1 (F-41); shielding gas is argon. DOE

N86-20818# Connecticut Univ., Storrs.
INVESTIGATION OF ROLE OF SUBSURFACE ZONES IN WEAR OF MATERIALS Final Report
R. Solecki, H. Nowotny, and S. L. Rice Aug. 1985 9 p
(Contract DE-AC02-81ER-10910)
(DE86-001862; DOE/ER-10910/03-FR) Avail: NTIS HC A02/MF A01

Experimental work was conducted with wear tests in both the undirectional sliding and reciprocating impact modes. Experimental results included weight loss and/or volume change measurements, and specimens were analyzed for subsurface zone characteristics by optical and scanning electron microscopy, energy-dispersive X-ray analysis, and by powder X-ray techniques. Theoretical work was based, in part, upon finite-element analysis of subsurface zone development, including thermo-elastoplastic work hardening with temperature-dependent physical properties. The effect of the geometry on the magnitude of the stress intensity factor of a rigid sliding specimen was also investigated. DOE

N86-20819# Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Plant.
ALLCORR WELDING AND WELDMENT CORROSION RESISTANCE
C. F. Jenkins and T. A. Jones 1985 31 p Presented at the ASM Metals Congress - International Conference on Surface Modifications, Toronto, Ontario, 13 Oct. 1985
(Contract DE-AC09-76SR-00001)
(DE86-001973; DP-MS-85-4; CONF-8510160-6) Avail: NTIS HC A03/MF A01

The corrosion and mechanical properties of Allcorr are affected by precipitation of coarse secondary phases at grain boundaries occurring during welding or heat treatment at 700 to 1100(0)C. Welding parameters were varied in an attempt to minimize property degradation and develop an acceptable joining technique for the alloy. The flow characteristics of Allcorr allow welding with low heat input, though special care is required to insure full penetration. Low heat input welding preserves the good corrosion resistance of the alloy. A solution heat treatment at 1200(0)C restores maximum corrosion resistance in Allcorr. DOE

N86-20820# Department of Energy, Morgantown, W. Va.
CIVIL AND MECHANICAL ENGINEERING APPLICATIONS OF SENSITIVITY ANALYSIS
V. Komkov Jul. 1985 21 p
(DE85-013611; DOE/METC-85/4031) Avail: NTIS HC A02/MF A01

In this largely tutorial presentation, the historical development of optimization theories has been outlined as they applied to mechanical and civil engineering designs and the development of modern sensitivity techniques during the last 20 years has been traced. Some of the difficulties and the progress made in overcoming them have been outlined. Some of the recently developed theoretical methods have been stressed to indicate their importance to computer-aided design technology. DOE

N86-20821# Oak Ridge National Lab., Tenn.
GAS TUNGSTEN ARC WELDING OF CHROMIUM-NICKEL STEEL LIMITED TO SPECIAL APPLICATIONS (AUTOGENOUS WELDING). WELDING PROCEDURE SPECIFICATION
C. H. Wodtke, D. R. Frizzell, and W. A. Plunkett Aug. 1985 12 p
(Contract DE-AC05-84OR-21400)
(DE86-001502; ORNL/M-16) Avail: NTIS HC A02/MF A01

Procedure WPS-307 is qualified under Section IX of the ASME Boiler and Pressure Vessel Code for gas tungsten arc welding of 300 series austenitic Cr-Ni stainless steels (P-8-1), in thickness range 0.020 to 0.125 in.; filler metal is not used; shielding gas is argon. DOE

N86-20822# Oak Ridge National Lab., Tenn.
GAS TUNGSTEN ARC DC WELDING OF ALUMINUM ALLOYS 6XXX. WELDING PROCEDURE SPECIFICATION
C. H. Wodtke, D. R. Frizzell, and W. A. Plunkett Aug. 1985 9 p
(Contract DE-AC05-84OR-21400)
(DE86-001511; ORNL/M-25) Avail: NTIS HC A02/MF A01

Procedure WPS-1007 is qualified under Section IX of the ASME Boiler and Pressure Vessel Code for gas tungsten arc welding of aluminum alloys 6061 and 6063 (P-23), in thickness range 0.125 to 2.0 in.; filler metal is ER4043 (F-23); current is direct; shielding gas is helium. DOE

N86-20823# Oak Ridge National Lab., Tenn.
GAS TUNGSTEN ARC (DC) WELDING OF ALUMINUM ALLOYS 3004, 5052, AND 5X54 TO 6XXX. WELDING PROCEDURE SPECIFICATION
C. H. Wodtke, D. R. Frizzell, and W. A. Plunkett Aug. 1985 8 p
(Contract DE-AC05-84OR-21400)
(DE86-001526; ORNL/M-40) Avail: NTIS HC A02/MF A01

Procedure WPS-2206 is qualified under Section IX of the ASME Boiler and Pressure Vessel Code for gas tungsten arc welding of aluminum alloys 3004, 5052, 5154, and 5454 (P-22) to 6061 and 6063 (P-23), in thickness range 0.187 to 2.0 in.; filler metal is ER4043 (F-23); current is direct; shielding gas is helium. DOE

N86-20824# Oak Ridge National Lab., Tenn.
GAS TUNGSTEN ARC WELDING OF CHROMIUM-NICKEL STEEL TO NICKEL. WELDING PROCEDURE SPECIFICATION
C. H. Wodtke, D. R. Frizzell, and W. A. Plunkett Aug. 1985 13 p
(Contract DE-AC05-84OR-21400)
(DE86-001533; ORNL/M-47) Avail: NTIS HC A02/MF A01

Procedure WPS-2601-ASME-3 is qualified under Section IX of the ASME Boiler and Pressure Vessel Code for gas tungsten arc welding 300 series Cr-Ni steels (P-8-1) to nickel N02200 or N02201 (P-41), in thickness range 0.035 to 0.432; filler metal is ERNi-Cr-3 (F-43); shielding gas is argon. DOE

N86-20825# Lawrence Livermore National Lab., Calif.
EXPLOSIVE CONSOLIDATION OF ALUMINUM NITRIDE POWDER
M. L. Wilkins, A. S. Kusubov, and C. F. Cline Jun. 1985 30 p
Presented at the EXPLOMET 85 International Conference on Metallurgical Applications of Shock Wave and High Strain-rate Phenomena, Portland, Ore., 28 Jul. 1985
(Contract W-7405-eng-48)
(DE86-001574; UCRL-92861; CONF-850770-12) Avail: NTIS HC A03/MF A01

Aluminum nitride is used as a model material for studying methods for the consolidation of high strength ceramics and metal alloys by dynamic compaction. Experiments coupled with computer simulations are used to explore fabrication techniques. The objective is to develop a methodology for manufacturing high strength material systems by dynamic compaction. DOE

N86-20826# SKF Industries, Inc., King of Prussia, Pa.
MECHANICAL INTERACTIONS OF ROUGH SURFACES Quarterly Progress Report, 30 Jun. - 30 Sep. 1985
J. I. McCool Oct. 1985 16 p
(Contract DE-AC02-84ER-13163)
(DE86-001602; DOE/ER-13163/8) Avail: NTIS HC A02/MF A01

Traction data from 115 tests were compiled into a database using commercial database management software. This enables quick and convenient examination of trends and effects. An example plot and tabulation produced using the database software is given. A reformulation of the traction computation under an elastic/plastic rheological model and in the presence of spin is discussed. Employed within computer program TRIBOS, this formation is shown to reproduce computed values found in the literature. Using TRIBOS, thus revised, it is then shown that the asymmetry of a plot of traction curve slope against spindle skew angle may be explained by an elastic/plastic model when the inherent spin of the rig is considered. The project is an experimental/analytical investigation to: (1) explore the behavior of lubricated concentrated contacts involving microscopically rough surfaces under conditions of combined rolling, sliding and spinning with and without the presence of contaminating particles, and (2) develop processing principles and techniques for the analysis of digitized rough surface profiles to yield surface descriptors that are predictive of functional performance and which have acceptable systematic and random error. DOE

N86-20827# TRW Space Technology Labs., Redondo Beach, Calif. Engineering Sciences Lab.
COMBUSTION PHENOMENA IN CI ENGINES Final Report, 30 Nov. 1984 - 20 Aug. 1985
F. Fendell 1985 49 p
(Contract DE-AC04-84AL-25994)
(DE85-016574; TRW-SN-44134-000) Avail: NTIS HC A03/MF A01

TRW has initiated theoretical modeling and experimental measurement of soot formation and oxidation in a laminar counterflow apparatus, as a step toward the goal of evolving novel strategies for in-cylinder reduction of particle levels in diesel engines. A sequence of experiments is envisioned, whereby a gaseous fuel species is flowed against a hot inert stream, against a hot inert stream with oxides that can be reduced, and against air. A range of intrusive (sampling with gas chromatography, thermocouples, streak photography, etc.) and nonintrusive (laser-beam absorption and scattering) diagnostics are being evaluated for obtaining the soot number density, particle typical dimension, temperature, major-species concentrations, etc. Until laboratory data are available, solution procedures for the theoretical model, which couples a conventional diffusion-flame analysis for the basic thermodynamic and dynamic fields with a kinetic-theory-type phase-plane analysis for the soot-related fields, are to be evolved and evaluated by processing of conceptual data. DOE

N86-20828# Wisconsin Univ., Madison.
INVESTIGATION OF THE EFFECTS OF ALTERNATIVE FUEL PROPERTIES ON COMBUSTION AND EMISSION MECHANISMS IN DIRECT INJECTION ENGINES
H. Ng and G. Borman Apr. 1985 106 p
(Contract DE-AI01-81CS-50006)
(DE85-017008; DOE/CS-50006/2) Avail: NTIS HC A06/MF A01

Six different fuels were tested using a TACOM-LABECO modified single cylinder direct injection diesel engine with a four hole nozzle and a 24:1 compression. The six fuels tested were a blend of commercial diesel fuels Numbers 1 and 2 giving a cetane number of 43.3, JP-7 with only 2% aromatic content and a cetane number of 57.2, two bends of one-ring (benzene-ring) aromatic solvent and JP-7 giving cetanes of 31.3 and 41.7, and two bends of two-ring (naphthalene-ring) aromatics giving cetane numbers of 30.3 and 41.2 respectively. The two-ring aromatic blends gave 20 to 30% more particulates than the corresponding one-ring aromatic blends. The two-ring aromatic blends had a lower flame temperature at the beginning diffusion-burning period than the corresponding cetane number one-ring aromatic blends. Radiance data indicated that there were more in-cylinder particulates during that period in the two-ring than the one-ring blends. It was found that the lower cetane and one-ring blends had a larger fraction of homogeneous (premixed) burning than the higher cetane and two-ring blends respectively. DOE

N86-20829# Technische Hogeschool Twente, Enschede (Netherlands). Dept. of Mechanical Engineering.
METHODICAL USE OF PRINCIPLES OF KINEMATICS WITH RESPECT TO ROTARY PUMPS AND ENGINES
J. H. B. Stulen Oct. 1984 18 p refs
(RR-WB-84-14) Avail: NTIS HC A02/MF A01

The use of principles of kinematics in designing rotary engines is discussed. The methodical way of treatment delivers a coherent and surveyable collection of forms. The constant transmission ratio gives a great variety of trochoidal forms useful for point-flank contacts in rotary engines or pumps. Truncation or hollowing the trochoids and a multiple use enlarge their utility. Envelopes due to cycloidal motion of a generating curve may be used for flank-flank contacts. Here too truncation or hollowing and a multiple form widens the possibilities of application. Author (ESA)

N86-20830# Technische Hogeschool, Delft (Netherlands). Metalworking Technology Section.
THE RESISTANCE WELDING OF A MICRO THERMOCOUPLE TO A WORKPIECE. VOLUME 2: FIGURES [HET WEERSTANDSLASSEN VAN EEN MIKRO-THERMOKOPPEL VAAN EEN WERKSTUK (FIGUREN)]
R. Nooder 17 Jan. 1983 29 p In DUTCH 2 Vol.
(Rept-14A18-Vol-2) Avail: NTIS HC A03/MF A01

Layouts, tables, and figures of the article on welding a thermocouple to a workpiece are presented. Author (ESA)

N86-20831# Technische Hogeschool, Delft (Netherlands). Metalworking Technology Section.
THE RESISTANCE WELDING OF A MICRO THERMOCOUPLE TO A WORKPIECE. VOLUME 1: TEXT
R. Nooder 17 Jan. 1983 43 p refs In DUTCH; ENGLISH summary 2 Vol.
(Rept-14A18-Vol-1) Avail: NTIS HC A03/MF A01

Based on a model for the arc welding of a single 50 micrometer diameter 100 Cr6 wire at right angles to the surface, the welding of a micro thermocouple to a workpiece with electric pulses was investigated. The micro thermocouple was developed for countersinking temperature measurements, but its attachment to the workpiece caused problems. Connected to the positive pole of a small condensor, the couple was approached to the piece with constant velocity to create an arc for a first attachment. Next the contact surface was increased with a small pulse (transitional resistance minimal). The connection strength was maximized using a strong pulse. Determining magnitudes are the heat developed in the weld and the force exerted by the couple on the weld. They depend on the input energy. The power of the pulses depends upon the object to be welded and must be found through experience. Author (ESA)

N86-20832# European Space Agency, Paris (France).
MASS AND HEAT TRANSFER IN REFLUX CONDENSERS FOR ABSORPTION HEAT PUMPS
Robert Mack Aug. 1985 43 p refs Transl. into ENGLISH of "Stoff- u. Waermeuebertragung bei Ruecklaufkuehlern fuer Absorptionswaermepumpen' Rept. DFVLR-FB-84-43 Hardthausen am Kocker, West Germany, Jul. 1984 Original language document was announced as N85-24266
(ESA-TT-912; DFVLR-FB-84-43) Avail: NTIS HC A03/MF A01; original German version available from DFVLR, Cologne DM 15.50

An equation to calculate horizontal reflux condensers was deduced. It makes mass and heat transfer computable depending on known numerical values of the process variables. The equation is demonstrated by experiments with two absorption heat pumps working with ammonia water solution. Parameter studies are made with a computer program to show the different dependences and

to guarantee an efficient construction. The program is extended to allow the computation of other than nominal conditions. Computation and test results show good agreement. Author (ESA)

N86-20833# Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.
LARGE PROBLEM FACILITIES FOR DYNAMICS
J. vanBeest 1983 124 p
(ICES-STRUDL-83-3; B8575346) Avail: NTIS HC A06/MF A01

Modifications to the STRUDL VM28 version to incorporate the large problem option such that dynamic analysis can be interrupted at critical points are presented. Load modules used during the dynamic analysis were reorganized. Author (ESA)

N86-20834# Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.
ICES-STRUDL V2M8. UPDATE TO THE ENGINEERING USER MANUAL
J. vanBeest, E. A. Guse, A. W. M. Kok, C. F. Vrijman, and A. deBoer 1983 43 p refs
(ICES-STRUDL-83-4; B8575347) Avail: NTIS HC A03/MF A01

Estimation of start vectors for the inverse power method in the STRUDL structural analysis program; an addition to members properties command in plastic frame analysis; selective backsubstitution and output commands for a steady state analysis and a transient analysis; implementation of heat analysis in STRUDL V2M8; implementation of the linear buckling in STRUDL V2M8; and large problem and subspace option for dynamics are outlined. Author (ESA)

N86-20835# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
ON THE EFFICIENCY OF STIFFENED PANNELS WITH APPLICATION TO SHEAR WEB DESIGN
A. Rothwell Jul. 1984 31 p refs
(VTH-M-518) Avail: NTIS HC A03/MF A01

Criteria for the design of stiffened panels, based on the concept of efficiency, are reviewed. The shear web example is chosen, and results for conventional stiffened webs, truss webs, post-buckled designs, and webs of corrugated cross-section are presented. Author (ESA)

N86-20836# AiResearch Mfg. Co., Torrance, Calif.
HIGH-TEMPERATURE CERAMIC RECUPERATOR AND COMBUSTION AIR BURNER PROGRAMS Program Summary, Apr. 1981 - Mar. 1984
H. J. Strumpf, D. M. Kotchick, and M. G. Coombs Aug. 1985 59 p
(Contracts GRI-5083-231-0961; GRI-5080-342-0440; GRI-5080-342-0439)
(PB86-102712; Rept-84-21508; GRI-85/0067) Avail: NTIS HC A04/MF A01 CSCL 13A

A study has been performed for the development of a ceramic recuperator and its companion high-temperature preheated combustion air burner. The system is designed to operate in a variety of industrial flue gas streams with exhaust temperatures up to 15000 F. Current ceramic recuperator and high-temperature burner systems were reviewed. Industrial processes with flue gas temperatures in excess of 1900 F were identified and quantified to ascertain market potential. Conceptual designs of ceramic recuperators and burners were developed and evaluated for four promising industrial applications. A preliminary reference design of a high-temperature combustion air system was developed for a typical steel soaking pit application. The design and fabrication of a 5-MMBtu/hr prototype recuperator was completed. An industrial burner capable of operating with 2000 F combustion air was procured. GRA

N86-20837# AiResearch Mfg. Co., Torrance, Calif.
HIGH-TEMPEATURE CERAMIC RECUPERATOR AND COMBUSTION AIR BURNER PROGRAMS: MARKET POTENTIAL AND ECONOMIC ANALYSIS Topical Report, Apr. 1981 - Oct. 1983
H. J. Strumpf, D. M. Kotchick, and M. G. Coombs Aug. 1985 122 p refs
(Contracts GRI-5083-231-0961; GRI-5080-342-0439; GRI-5080-342-0440)
(PB86-102753; Rept-84-21511; GRI-85/0068) Avail: NTIS HC A06/MF A01 CSCL 13A

The summary covers a portion of a comprehensive study performed for the development of a ceramic recuperator and its companion high-temperature preheated combustion air burner. The system is designed to operate in a variety of industrial flue gas streams with exhaust temperatures up to 2500 F. The ceramic recuperator provides up to 2000 F preheated combustion air to the high-temperature burner. Current ceramic recuperator and high-temperature burner systems were reviewed industrial processes with flue gas temperatures in excess of 1900 F were identified and quantified to ascertain market potential. Conceptual designs of ceramic recuperators and burners were developed and evaluated for four promising industrial applications. GRA

N86-20838# AiResearch Mfg. Co., Torrance, Calif.
HIGH-TEMPERATURE CERAMIC RECUPERATOR AND COMBUSTION AIR BURNER PROGRAMS: TESTING OF A HIGH-TEMPERATURE BURNER Topical Report, Apr. 1981 - Oct. 1983
H. J. Strumpf, D. M. Kotchick, M. G. Coombs, and G. Hossepian Aug. 1985 122 p
(Contracts GRI-5083-231-0961; GRI-5080-342-0440)
(PB86-103819; Rept-84-21510; GRI-85/0066) Avail: NTIS HC A06/MF A01 CSCL 13A

The resport describes part of a comprehensive effort performed to support the development of a high-temperature waste heat recovery system. The system includes a ceramic recuperator and a high-temperature combustion air burner. This topical report covers the testing of a high-temperture, preheat, 15-MMBtu/hr industrial burner. The burner was successfully operated at preheated air temperatures up to 2000 F. GRA

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

No abstracts in this category.

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N86-20839 Michigan Univ., Ann Arbor.
AN IMPROVED 2-DIMENSIONAL GRILLAGE METHOD FOR ANALYZING ORTHOGONALLY STIFFENED PLATED GRILLAGE STRUCTURES Ph.D. Thesis
Kyu Nam Cho 1985 94 p
Avail: Univ. Microfilms Order No. DA8512384

An improved simplified modeling method for the analysis of orthogonally stiffened plated grillage structures is presented. The simplified method improved is two-dimensional grillage modeling, whereby the plating cover is lumped with the beam elements representing the orthogonal stiffener system. More accurate determination of the grillage beam section properties is based on rational reduction of accurate three-dimensional model characteristics through a modified static condensation procedure. A general three-dimensional procedure which overcomes the well known

problems with nonconforming beam and planestress plate elements, and thus gives more accurate and reliable solutions, is also developed. This procedure provides the basis for evaluating the two-dimensional grillage modeling procedure, and provides the global matrices for the systematic grillage beam section property reductions. The theory and numerical model are applied to a typical orthogonally stiffened plated grillage structure. Comparison with accurate three-dimensional calculations supports the reliability of the simplified method developed. Author

N86-20840 Texas Univ., Austin.
ULTIMATE STRENGTH OF TUBULAR JOINTS SUBJECTED TO COMBINED LOADS Ph.D. Thesis
Peter Windell Hoadley 1984 296 p
Avail: Univ. Microfilms order No. DA8513230

Nine tests were conducted on double-tee (DT) tubular joints subjects to various combinations of axial load, in-plane bending and out-of-plane bending in the branch. These tests along with three reference tests (axial load alone, in-plane bending alone, and out-of-plane bending) were used to study joint interaction and to develop equations for joint design. It was found that the branch load interaction was best represented by the following equation: P/P sub u + (M/M sub n) sub OPB sup 1.2 + (M/M sub u) sub 1PB sup 2.1 = 1.0. The equation of the type used in Supplement 1 to the 13th Edition of the American Petroleum Insititute (API) Specification, namely P/P sub u + 2/pi arcsine square root (M/M sub u) sub 1PB sup 2 + (M/M sub u) sub OPB sup 2 = 1.0 was found to be slightly unconservative when P sub u and M sub u are based on experimental results. When API predictions of P sub u and M sub u are used, the arcsine equation was very conservative in many instances because M sub u is underestimated. Strain gage measurements were used to determine the SCF at the toe of the weld for axial load, in-plane bending and out-of-plane bending. Author

N86-20841* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
CRYOGENIC INSULATION STRENGTH AND BOND TESTER Patent
Paul H. Schuerer, James H. Ehl, and Willibald P. Prasthofer, inventors (to NASA) Issued 22 Oct. 1985 11 p Filed 3 Nov. 1983
(NASA-Case-MFS-25910-1; US-Patent-4,548,083;
US-Patent-Appl-SN-548582; US-Patent-Class-73-827;
US-Patent-Class-73-150-A) Avail: US Patent and Trademark Office CSCL 20K

A method and apparatus for testing the tensile strength and bonding strength of sprayed-on foam insulation attached to metal cryogenic fuel tanks is described. A circular cutter is used to cut the insulation down to the surface of the metal tank to form plugs of the insulation for testing in situ on the tank. The apparatus comprises an electromechanical pulling device powered by a belt battery pack. The pulling device comprises a motor driving a mechanical pulling structure comprising a horizontal shaft connected to two bell cracks which are connected to a central member. When the lower end of member is attached to a fitting, which in turn is bonded to a plug, a pulling force is exerted on the plug sufficient to rupture it. The force necessary to rupture the plug or pull it loose is displayed as a digital read-out.
Official Gazette of the U.S. Patent and Trademark Office

N86-20842 British Library Lending Div., Boston Spa (England).
ALLOWANCE FOR FORCES OF INERTIA IN MECHANICAL TESTING OF METAL
V. A. Osadchii, V. T. Zhadan, and A. V. Rumyantsev 1985 5 p Transl. into ENGLISH from Izv. VUZ, Chernaya Metall. (Moscow, USSR), no. 5, 1955 p 107-109
(BLLD-Trans-M-36512-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The effects of the forces of inertia of both the specimen itself and those of the auxiliary mechanisms are examined in the modeling of processes entailing loading at high speeds with varying rate of deformation. B.G.

N86-20843 Rensselaer Polytechnic Inst., Troy, N.Y.
AN EXPERIMENTAL STUDY OF BIAXIAL INELASTIC DEFORMATION BEHAVIOR OF ENGINEERING ALLOYS IN SUPPORT OF VISCOPLASTICITY THEORY AND LIFE PREDICTION Ph.D. Thesis
1985 239 p
Avail: Univ. Microfilms Order No. DA8519501

The measured stress strain responses under various biaxial monotonic and cyclic proportional and nonproportional histories are compared with the predictions of the classical flow law of plasticity and the viscoplasticity theory based on overstress. The role of accumulated inelastic strain in materials modeling was studied using proportional, to step, and two-step loadings. Hardening and rate-dependence were investigated using fully reversed strain controlled axial (a), torsional (T), in-phase (I), and out-of-phase (O) loadings. During cycling the normalized stress amplitude was observed to increase nearly threefold. After the A, T and I segments, a cross effect was oserved which was not seen following the O-segment. The applicability of the viscoplasticity theory in fatigue-creep life predictions was studied. It is shown that the predictions reflect both qualitativity and quantitatively the strain rate and hold time effects. Dissert. Abstr.

N86-20844 Brown Univ., Providence, R. I.
AN EXAMINATION OF CRACK TIP FIELDS IN BRITTLE MATERIALS SUBJECTED TO DYNAMIC LOADING Ph.D. Thesis
Chien-Ching Ma 1985 154 p
Avail: Univ. Microfilms Order No. DA8519870

Several phenomena which were observed in experiments involving brittle materials subjected to dynamic loading do not seem to follow the usual concepts of linear elastic fracture mechanics. Some of these phenomena are examined on the basis of theoretical models. Fracture initiation and crack growth in a plate due to dynamic pressure loading on the faces of a pre-existing crack are considered. The problem is formulated within the framework of two dimensional elastodynamics, and the system is viewed as a semi-infinite crack in an otherwise unbounded body. The overall features of the model were selected to simulate recent experiments on dynamic fracture of Homalite-100 in which the optical shadow spot method was used to measure the time history of the stress intensity factor. Dissert. Abstr.

N86-20845 Akron Univ., Ohio.
FINITE ELEMENT ANALYSIS OF TRANSIENT CONTACT Ph.D. Thesis
Yukio Nakajima 1986 396 p
Avail: Univ. Microfilms Order No. DA8520438

The contact analysis of deformable bodies is one of the major research areas in finite element analysis. A development solution to the problem of transient contact, is discussed. In relation to the tire industry, the satisfactory analysis of transient contact is of growing importance as the demand for increased ride comfort, but lower tire rolling resistance is imposed. A finite element procedure that solves transient contact problems subject to time dependent boundary conditions was developed. Two contact procedures were implemented in ADINA, the Lagrange multiplier method and the penalty function method. Several numerical experiments which illustrate the capabilities of the schemes to analyze sliding/rolling contact over a bump or hole are presented. Dissert. Abstr.

N86-20846 Purdue Univ., West Lafayette, Ind.
DETERMINISTIC AND NON-DETERMINISTIC RESPONSE ANALYSIS OF COMPLEX SHELLS Ph.D. Thesis
Rakesh Kumar Kapania 1985 187 p
Avail: Univ. Microfilms Order No. DA8520023

Finite element analysis capabilities are developed for performing deterministic and nondeterministic responses of complex thin shells. A set of shell elements is adopted, modified or extended to study the seismic and wind responses of column supported cooling towers. For the deterministic responses, both the modal superposition and the time integration methods are used and for the nondeterministic responses both frequency domain analysis

and the time analysis methods are used. For the frequency domain analysis, a finite element formulation and Gaussian quadrature procedure, using both the direct complex matrix inversion and the modal superposition methods, are presented. Results are obtained for a simply supported cylindrical panel under purely random loads and for a cooling tower subjected to random wind loads are at three different wind velocities, based on the quasi-steady aerodynamic theory and Davenport's spectrum for wind fluctuations. Random wind response analysis of a cooling tower is also performed using Monte Carlo simulation approach. Dissert. Abstr.

N86-20847 California Inst. of Tech., Pasadena.
ON THE EXISTENCE AND UNIQUENESS OF THE SOLUTION TO THE SMALL-SCALE NONLINEAR ANTI-PLANE SHEAR CRACK PROBLEM IN FINITE ELASTOSTATICS Ph.D. Thesis
Jason Masao Wakugawa 1985 84 p
Avail: Univ. Microfilms Order No. DA8519568

Existence and uniqueness of the solution to the small scale nonlinear antiplane shear crack problem in finite elastostatics are addressed. The hodograph transformation, commonly used in the theory of compressible fluid flows, plays an essential role. Existence is established by exhibiting an exact closed form solution, constructed via the hodograph transformation. Uniqueness is established by first proving the uniqueness of the solution to a related boundary value problem, which is linear by virtue of the hodograph transformation, and then examining the implications of this result on the original problem. The possibility of making some of the conditions imposed on the solution to the small scale nonlinear crack problem less restrictive is then investigated. This leads to several further results, including estimates of the nonvanishing shear stress component of the stress tensor along the crack faces. Dissert. Abstr.

N86-20848 California Inst. of Tech., Pasadena.
DYNAMIC RESPONSE OF A PARTIALLY EMBEDDED BAR UNDER TRANSVERSE EXCITATIONS Ph.D. Thesis
Ronald Y. S. Pak 1985 120 p
Avail: Univ. Microfilms Order No. DA8519558

The dynamic response of a finite flexible bar partially embedded in a half space, under transverse loadings is examined. The loadings are applied at the unembedded end of the bar and may, in general, be a combination of time/harmonic shear and moment. The problem is intended to serve as a fundamental idealization for the dynamic analysis of piles or other embedded foundations whose flexibilities are not negligible. By treating the bar as a one dimensional structure and the half space as a three dimensional elastic continuum, the interaction problem is formulated as a Fredholm integral equation of the second kind. The essential tool required in the formulation is a group of Green's function which describe the response of an elastic half space to a finite, distributed, buried source which acts in the lateral direction. Dissert. Abstr.

N86-20849 British Aerospace Aircraft Group, Warton (England). Aircraft Group.
A DEVELOPMENT OF THE CRACK GROWTH RESISTANCE CURVE (R-CURVE) TECHNIQUE AT BAe, WARTON
A. Schofield Nov. 1984 16 p refs
(BAe-MDR-0748) Copyright. Avail: Issuing Activity

The crack growth resistance curve (R-Curve) is the parameter normally used to predict failure in thin sheet materials where plane stress conditions are developed at the crack tip. The R-Curve is of particular use where long cracks are produced in wide panels, for example in combat damaged skin panels. Hence, the R-Curve is an essential part of any damage tolerant design or analysis approach to airframe structure. Author (ESA)

N86-20850# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
EFFECT OF DIFFERENT FACTORS ON THE SENSITIVITY OF ENGINEERING MATERIALS TO STRESS CONCENTRATION IN THE CASE OF FATIGUE LOADING
A. Buch Aug. 1984 55 p refs
(TAE-551) Avail: NTIS HC A04/MF A01

More accurate fatigue test results were used for verification of different calculation methods and for establishing a more reliable relationship between the notch factor and the notch radius. Scatter bands for the dependence of the notch sensitivity K (sub F)/K (sub T) on the notch radius were obtained for steel specimens with stress concentration factors K (sub T) is equal to or less than 3.6, with particular consideration of test results for large component similar specimens with large notch radii. The scatter bands of test points were plotted separately for tempered and normalized steels, but the rotating/bending and tension/compression test results were considered together. Their upper and lower boundaries were expressed analytically with a two parameter formula. This formula takes better into account the notch size effect than the formulas of Neuber, Peterson or Stieler. Author

N86-20851# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
REPEATED BUCKLING OF GRAPHITE EPOXY SHEAR PANELS WITH BONDED METAL STIFFENERS
T. Weller, G. Messer, and A. Libai Aug. 1984 54 p refs Sponsored in part by European Office of Aerospace Research and Development
(Contract AF-AFOSR-0103-82)
(TAE-546; SR-5) Avail: NTIS HC A04/MF A01

The durability of hybrid Wagner type beams (Gr/Ep shear web stiffened by a bonded aluminum frame) subjected to repeated deep bucklings in shear was investigated. Test results demonstrated that: composite shear webs can withstand loads which correspond to many times of their buckling, and be utilized safely in the deep postbuckling region; utmost fibers in the stacking sequence should be placed in tension field direction to increase both fatigue life and ultimate strength of the web; composite shear webs are less sensitive to fatigue than metal ones; and fatigue damage in a composite web does not necessarily lead to comprehensive failure. Author

N86-20852# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
STIFFENED SHEAR PANELS SUBJECTED TO REPEATED BUCKLINGS: DURABILITY STUDIES
A. Libai, T. Weller, M. Kollet, and J. Singer Jul. 1984 65 p refs Prepared in part for European Office of Aerospace Research and Development, London, England
(Grant AF-AFOSR-0103-82)
(TAE-545; SR-4) Avail: NTIS HC A04/MF A01

The durability of Wagner-Type metal shear panels subjected to repeated bucklings was investigated. The numbers of buckling cycles to crack initiation, extension and failure were measured for beams with various combination of web thickness, stiffener properties and panel aspect ratios. Tests were supported by analysis. Design prediction formulas were constructed, and important parameters were identified. Qualitative results showed that the load at which local yielding initiates along the panel boundary near the tension diagonal is the best single predictor of the life of the panels. The effects of the (ultimate/cyclic) load ratio on panel durability are much more pronounced than those of the corresponding (cyclic/buckling) load ratio. Strengthening of boundary stiffeners is not fully utilizable for increasing the working loads due to adverse effects on structural life. Author

N86-20853# Queensland Univ., St. Lucia (Australia). Dept. of Civil Engineering.
INELASTIC EXPERIMENTS ON ANGLE AND TEE STRUTS
S. Kitipornchai and H. W. Lee Aug. 1984 35 p refs
(CE54) Avail: NTIS HC A03/MF A01

An experimental investigation was made of the inelastic buckling of axially loaded, pinned end single angle, tee, and double angle struts. A total of 54 struts with modified slenderness ranging from 0.33 to 1.08 was tested. Specially designed pinned end supports allowed the end cross sections to rotate about the major and minor axes, but restrained them against twisting about the longitudinal axis. All struts failed in the inelastic range by excessive

bending and twisting. The experimental results compared with the theoretical predictions and with other test results. It was found the related design rules in the current Australian AS 1250-1981 and American AISC Specification are satisfactory for single and double angle struts, but are slightly unsafe for tee struts. Experimental results are compared with the SSRC multiple column curves. Author

N86-20854# Queensland Univ., St. Lucia (Australia). Dept. of Civil Engineering.
INELASTIC BUCKLING OF SINGLE ANGLE, TEE AND DOUBLE ANGLE STRUTS
S. Kitipornchai and H. W. Lee Sep. 1984 35 p refs
(CE55) Avail: NTIS HC A03/MF A01

The inelastic flexural and flexural-torsional buckling of axially loaded, pinned end single angle, tee and double angle struts are investigated theoretically. The calculated inelastic buckling loads are based on the tangent modulus concept, assuming idealized residual stress distributions in the strut sections. In the inelastic range, although the elastic flexural-torsional buckling loads for some struts are less than the elastic flexural buckling loads, results show that the inelastic buckling loads of the struts are not at all influenced by nor related to the elastic flexural-torsional buckling loads. Flexural buckling mode is the dominant failure mode for most of the strut shapes, except for single unequal angles and for tees and double angles whose radii of gyration ratios, r(subx)/r (suby) are greater than 1.0. Experimental results compare well with the ultimate strength curves, except for tee struts in which experimental buckling loads are consistently lower than the theoretical predictions. Author

N86-20855*# Failure Analysis Associates, Palo Alto, Calif.
A REVIEW OF FRACTURE MECHANICS LIFE TECHNOLOGY Final Report
Philip M. Besuner, David O. Harris, and Jerrell M. Thomas Washington NASA Feb. 1986 431 p refs
(Contract NAS8-34746)
(NASA-CR-3957; NAS 1.26:3957) Avail: NTIS HC A19/MF A01 CSCL 20K

Lifetime prediction technology for structural components subjected to cyclic loads is examined. The central objectives of the project are: (1) to report the current state of the art, and (2) recommend future development of fracture mechanics-based analytical tools for modeling subcritical fatigue crack growth in structures. Of special interest is the ability to apply these tools to practical engineering problems and the developmental steps necessary to bring vital technologies to this stage. The authors conducted a survey of published literature and numerous discussions with experts in the field of fracture mechanics life technology. One of the key points made is that fracture mechanics analyses of crack growth often involve consideration of fatigue and fracture under extreme conditions. Therefore, inaccuracies in predicting component lifetime will be dominated by inaccuracies in environment and fatigue crack growth relations, stress intensity factor solutions, and methods used to model given loads and stresses. Suggestions made for reducing these inaccuracies include development of improved models of subcritical crack growth, research efforts aimed at better characterizing residual and assembly stresses that can be introduced during fabrication, and more widespread and uniform use of the best existing methods. Author

N86-20856*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AN APPROXIMATE BUCKLING ANALYSIS FOR RECTANGULAR ORTHOTROPIC PLATES WITH CENTRALLY LOCATED CUTOUTS
Michael P. Nemeth, Manuel Stein, and Eric R. Johnson (Virginia Polytechnic Inst. and State Univ., Blacksburg, Va.) Feb. 1986 21 p refs
(NASA-TP-2528; L-16032; NAS 1.60:2528) Avail: NTIS HC A02/MF A01 CSCL 20K

An approximate analysis for predicting buckling of rectangular orthotropic composite plates with centrally located cutouts is presented. In this analysis, prebuckling and buckling problems are converted from a two-dimensional to a one-dimensional system of linear differential equations with variable coefficients. The conversion is accomplished by expressing the displacements as series with each element containing a trigonometric function of one coordinate and a coefficient that is an arbitrary function of the other coordinate. Ordinary differential equations are then obtained from a variational principle. Analytical results obtained from the approximate analysis are compared with finite element analyses for isotropic plates and for specially orthotropic plates with central circular cutouts of various sizes. Experimental results for the specially orthotropic plates are also presented. In nearly all cases, the approximate analysis predicts the buckling mode shapes correctly and predicts the buckling loads to within a few percent of the finite element and experimental results. Author

N86-20857*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SOLUTION OF THE SYMMETRIC EIGENPROBLEM AX=LAMBDA BX BY DELAYED DIVISION
Gaylen A. Thurston and Nancy J. C. Bains Mar. 1986 40 p refs
(NASA-TP-2514; L-15984; NAS 1.60:2514) Avail: NTIS HC A03/MF A01 CSCL 20K

Delayed division is an iterative method for solving the linear eigenvalue problem AX = lambda BX for a limited number of small eigenvalues and their corresponding eigenvectors. The distinctive feature of the method is the reduction of the problem to an approximate triangular form by systematically dropping quadratic terms in the eigenvalue lambda. The report describes the pivoting strategy in the reduction and the method for preserving symmetry in submatrices at each reduction step. Along with the approximate triangular reduction, the report extends some techniques used in the method of inverse subspace iteration. Examples are included for problems of varying complexity. Author

N86-20858# National Aeronautical Lab., Bangalore (India).
SYSTEM FOR AUTOMATED CRACK GROWTH TESTING UNDER RANDOM LOADING
R. Sunder Aug. 1984 24 p refs Sponsored in part by the Aeronautics Research and Development Board
(NAL-TM-MT-8-84) Avail: NTIS HC A02/MF A01

Procedures were developed for computer controlled crack propagation testing under random load sequences, they include features which are not available in conventional systems, but which appear essential for random load testing. These include the capability to simulate any desired K-function on standard laboratory specimens and continuous on-line Rainflow analysis of the test load sequence to exclude cycles falling below given values of threshold stress intensity, stress level or range. The system includes a procedure for automated COD-based crack opening/closing load level measurement. Experimental studies on Al-Cu alloy sheet material point to a requirement for development of standards for spectrum loading crack growth testing. E.A.K.

N86-20859# National Aeronautical Lab., Bangalore (India). Structures Div.
FIELD-CONSISTENT STRAIN INTERPOLATIONS FOR THE QUADRATIC SHEAR FLEXIBLE BEAM ELEMENT
G. Prathap and C. Ramesh Babu Feb. 1985 32 p refs Sponsored by Council for Scientific and Industrial Research
(NAL-TM-ST-8503) Avail: NTIS HC A03/MF A01

A shear flexible quadratic isoparametric beam element with three degrees of freedom per node is critically examined from the point of view of the consistency of the constrained strain fields that arise in the thin beam limits. The errors, in terms of convergence of displacement fields and violent oscillations of stress fields that emerge when exactly integrated elements are used, are predicted a priori and confirmed with numerical experiments. The rationale behind the use of optimal stress sampling at Gaussian points is also derived directly from these arguments. Author

N86-20860# National Aeronautical Lab., Bangalore (India). Structures Div.

A FIELD-CONSISTENT THREE-NODED QUADRATIC CURVED AXISYMMETRIC SHELL ELEMENT
G. Prathap and C. Ramesh Babu Feb. 1985 31 p refs Sponsored by Council for Scientific and Industrial Research
(NAL-TM-ST-8502) Avail: NTIS HC A03/MF A01

A curved three noded quadratic isoparametric axisymmetric thick shell element is developed. Field consistency interpretations allow various configurations of the element to be designed so as to satisfy specific problem needs. Typical applications demonstrate the versatility and accuracy of this element in its different problem specific forms. Author

N86-20861# National Aeronautical Lab., Bangalore (India). Structural Sciences Div.
ASKA AND CONSTRAINED MULTI-STRAIN-FIELD PROBLEMS
B. R. Somashekar, G. Prathap, and C. RameshBabu Sep. 1985 23 p refs
(NAL-TM-ST-8513) Avail: NTIS HC A02/MF A01

A computer program, ASKA, to computate multistrain fields is presented. The element libraries of most general purpose program packages are derived from the finite element method used in the sixties and seventies. These procedures met with large success in many applications, however, large grey areas of uncertainty remained. In these, elements which were in many respects excellent could fail dramatically in many practical situations. These problems were described as parasitic shear, shear locking, and the very poor performance of curved beams and shells was often attributed to lack of strain free rigid body motion, locking at incompressible or nearly incompressible limits. Some elements of ASKA program package are tested and reported. The field consistency options are introduced. The field consistency method can be applied with little modification to existing codes. E.A.K.

N86-20862# National Aeronautical Lab., Bangalore (India). Structures Div.
AN ISOPARAMETRIC QUADRATIC THICK CURVED BEAM ELEMENT
G. Prathap and C. Ramesh Babu May 1985 43 p refs Sponsored by the Council for Scientific and Industrial Research
(NAL-TM-ST-8505) Avail: NTIS HC A03/MF A01

A three-noded curved beam element with transverse shear deformation, based on independent isoparametric quadratic interpolations is designed from field-consistency principles. It is shown that a quadratic element that is field-inconsistent in membrane strain effects from membrane locking - i.e., an error of the second kind propagates indefinitely as element length to thickness ratio and/or element length to radius of curvature ratio increase, in nearly inextensional bending. However, field inconsistency in shear strain does not lead to shear locking but degrades its performance to exactly that of a field consistent linear element. It is also seen that field inconsistency leads to severe axial force and shear force oscillations. Error estimates for locking, wherever possible are derived and confirmed by numerical experiments. E.A.K.

N86-20863# National Aeronautical Lab., Bangalore (India).
CRACK GROWTH UNDER RANDOM LOADING: FATIGUE CYCLE ANALYSIS FOR TESTING AND LIFE PREDICTIONS
R. Sunder Aug. 1984 18 p refs Presented at the International Symposium on Strength at Sonic and Ultrasonic Frequencies, Kiev (USSR), 25-28 Sep. 1984
(NAL-TM-MT-9-84) Avail: NTIS HC A02/MF A01

The Rainflow cycle counting technique which is valid for fatigue crack growth analysis. This technique was incorporated into a procedure for engineering predictions of crack propagation life under random loading on the basis of experimental data for constant amplitude loading. Predictions require less computer time and offer an accuracy which favorably compares to that of existing techniques. A realtime computer procedure was developed for Rainflow based on on-line modification of random load sequencies during crack growth testing. On-line load sequence modification opens new possibilities in computer controlled testing. E.A.K.

N86-20864# National Aerospace Lab., Tokyo (Japan).
FUNDAMENTAL INVESTIGATION ON THE IMPACT STRENGTH OF HOLLOW FAN BLADES
Tameharu Ikeda, Toshio Miyachi, and Yasushi Sofue 1985 23 p refs In JAPANESE; ENGLISH summary
(NAL-TR-879; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

Models of hollow fan blades were made and tested to prove that their strength is sufficient for use in real engines. The hollow blades were fabricated by diffusion bonding of two titanium alloy (6Al-4V-Ti) plates, one of which had three spanwise stiffners and the other being flat plate. The model as a nontwisted tapered blade. Impact tests were carried out on the hollow fan blade models in which the ingestion of a 1.5 pounds bird was simulated. Solid blades with the same external form were also tested by similar methods for comparison. The results of these tests show that properly designed hollow blades have sufficient stiffness and strength for use as fan blades in the turbo-fan engine. Author

N86-20865# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mechanical Engineering.
ON THE ROLE OF DIMENSIONLESS ELASTIC FRACTURE MECHANICS Final Report, 15 Jan. 1984 - 14 Jan. 1985
G. B. Sinclair 3 Jul. 1985 117 p
(Grant AF-AFOSR-0047-84)
(AD-A161285; SM-85-14; AFOSR-85-0942TR) Avail: NTIS HC A06/MF A01 CSCL 20/11

Dimensionless elastic fracture mechanics - the nondimensionalized counterpart to linear elastic fracture mechanics (LEFM) - predicts size-independent strengths for geometrically similar specimens. This is in contrast to LEFM which has that the stress at fracture reduces as the inverse square root of the in-plane scale factor. It is shown that neither agrees with the data, irrespective of how brittle material response is. Used predictions is possible. However, both are essentially inadequate, since they lack valid underlying physical reasoning and, even as merely empirically based approaches, are short of sufficient accuracy to be reliable in practice. There is a need, therefore, to critically examine the very foundations of elastic fracture mechanics.
Author (GRA)

N86-20866# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
PREDICTING CATASTROPHIC OUTSIDE DIAMETER INITIATED FATIGUE FAILURE OF THICK-WALLED CYLINDERS USING LOW CYCLE FATIGUE DATA Final Technical Report
Joseph A. Kapp Sep. 1985 20 p Presented at the 9th Airapt High Pressure Conference 25-28 Jul. 1983
(AD-A161805; AD-E440305; ARLCB-TR-85035) Avail: NTIS HC A02/MF A01 CSCL 20/11

A procedure is presented to predict fatigue failure of thick-walled cylinders containing discontinuities at the outside diameter (OD). Both crack initiation life and crack growth are considered. The elastic-plastic strains at an OD discontinuity are estimated using elastic analysis and stress concentration factors. The strain estimates are then used in conjunction with low cycle fatigue data to determine the initiation life. Crack growth is estimated by integration of a power law relationship. The results obtained by using this analysis method compared to measured fatigue life data for several OD initiated failures in thick-walled cylinders agrees to within about ten percent. GRA

N86-20867# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
ASSESSMENT OF J-R CURVES OBTAINED FROM PRE-CRACKED CHARPY SAMPLES Final Technical Report
J. A. Kapp and M. I. Jolles Sep. 1985 27 p Presented at 17th National Fracture Mechanics Symposium Albany, N.Y., 7-9 Aug. 1984
(AD-A161806; AD-E440306; ARLCB-TR-85037) Avail: NTIS HC A03/MF A01 CSCL 20/11

J-R curves were determined for five materials (7075-T651; 2024-T351; HY130; HY80; and A723, Class 1, Grade 4) using precracked Charpy samples and standard size C(T) and SE(B)

samples. Crack growth in the Charpy samples was estimated using the load drop method of analysis of the load displacement trace, and crack extension in the C(T) and SE(B) specimens was determined using the electric potential method. The results show that physical crack extension in the larger sample was not well estimated by the Charpy sample results. However, if the crack extension is presented as relative crack growth (as a percentage of the uncracked ligament), the agreement between the two widely different specimen sizes is much better, although not exact. With the exception of the relatively brittle 7075-T651, the J corresponding to zero, 1% and 2% crack growth was higher in the Charpy samples than in the larger samples. This was attributed to the inability of the load drop method to determine the exact location of the crack initiation. Although nonconservative, we believe the load drop method analysis of precracked Charpy data is adequate for quality control toughness testing provided that it is realized that Jlc and J-R curves may be overestimated slightly. GRA

N86-20868# Sandia National Labs., Albuquerque, N. Mex.
RELATIVE CONSERVATISM AND DROP TABLE AND SHAKER SHOCK TESTS
T. J. Baca and T. D. Blacker 1985 22 p
(Contract DE-AC04-76DP-00789)
(DE86-001263; SAND-85-1394C) Avail: NTIS HC A02/MF A01

Judging the conservation of a mechanical shock test is a crucial concern of the engineer responsible for interpreting the outcome of the test. Either overtest or undertest can have devastating implications if the former results in a costly redesign of the structure being tested, or if the latter fails to properly qualify the structure for use in its design environment. A quantitative comparison of the relative conservatism of haversine and decaying sinusoid shock test input pulses which are generated on drop tables and electro-dynamic shakers is made. A complete evaluation of test conservatism between the laboratory and field shock environment requires characterization of shock severity and consideration of this characterization's statistical variation. A shock intensity spectrum (SIS) is introduced as a new shock characterization which provides information on the severity of the shock as a function of frequency. Test conservatism is quantfied in terms of an Index of Conservatism (IOC) and a novel criterion called an Overtest Factor (OTF). DOE

N86-20869# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Dept.
FATIGUE AND FRACTURE RESISTANCE OF WROUGHT PM 7091 AND IM 7050
R. J. H. Wanhill 28 May 1984 22 p refs Presented at International Conference and Exhibition on Powder Metallurgy Aerospace Materials, Bern, Switzerland, Nov. 1984 Sponsored by Netherlands Agency for Aerospace Programs
(NLR-MP-84055-U; B8569029) Avail: NTIS HC A02/MF A01

Investigation of the fatigue and fracture properties of PM 7091-T7E69 and IM 7050-T736 aluminum alloy die forgings reveals that under spectrum loading the fatigue crack propagation resistance of 7091-T7E69 is greatly inferior. This is due to tensile crack jumping which could be explained using Thomason's (1971) theory of tensile fracture. Fractographic and microstructural analysis supports this explanation. It is concluded that the oxides from air atomization of the powder cause early tensile crack jumping in 7091, and that potentially inferior fatigue crack propagation resistance is a generic problem for PM alloys containing a relatively high volume fraction of small oxide particles. Author (ESA)

N86-20870# Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.
IMPLEMENTATION OF THE LINEAR BUCKLING IN STRUDL V2M8
E. A. Guse 1982 27 p refs
(ICES-STRUDL-82-8; B8575344) Avail: NTIS HC A03/MF A01

Modifications of the STRUDL program to handle linear buckling of elastic beams in frame analysis are presented. The derivation of the initial stress matrix and solution algorithm are presented. Author (ESA)

N86-20871# Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.
SELECTIVE PRINT AND PLOT COMMANDS FOR A FINITE ELEMENT ANALYSIS
A. W. M. Kok 1983 46 p ref
(ICES-STRUDL-83-7; B8575349) Avail: NTIS HC A03/MF A01

Commands by which a graphical representation of stress results can be prepared and output in STRUDL program finite element analyses are presented. Author (ESA)

N86-20872# Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.
IMPLEMENTATION OF SUBSTRUCTURE COMMAND IN STRUDL V2M9
E. A. Guse 1983 36 p
(ICES-STRUDL-83-17; B8575352) Avail: NTIS HC A03/MF A01

Commands to enable the STRUDL program to obtain the stiffness matrices of similar substructures by exploiting the matrix of the basic substructure are presented. The example of the windows in a building is given. Author (ESA)

N86-20873# Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.
INITIAL STRAINS, STRESSES AND ELEMENT TEMPERATURE COMMAND IN STRUDL V2M9
E. A. Guse 1983 31 p
(ICES-STRUDL-83-18; B8575353) Avail: NTIS HC A03/MF A01

User commands for initial strains, stresses and element temperature in the STRUDL structural design program are given. Author (ESA)

N86-20874# Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.
ICES STRUDL USER MANUAL. PART 1: THE CALCULATION OF FRAMEWORKS
A. W. M. Kok, C. F. Vrijman, and A. deBoer Oct. 1984 135 p refs 6 Vol.
(B8575336-Pt-1) Avail: NTIS HC A07/MF A01

The linear static analysis of frame structures using STRUDL is covered. Language conventions, coordinate systems, general commands, topology, loading data, input controls, analysis, output commands, modifications of topology and loadings, and samples are presented. Author (ESA)

N86-20875# Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.
ICES STRUDL USER MANUAL. PART 2: ANALYSIS OF CONTINUOUS STRUCTURES WITH THE FINITE ELEMENT METHOD
A. W. M. Kok and C. F. Vrijman Oct. 1984 97 p refs 6 Vol.
(B8575337-Pt-2) Avail: NTIS HC A05/MF A01

The linear static analysis of continuous structures using the STRUDL program is covered. Coordinate systems, additional topological data, element properties, rigid bodies, joint ties and springs, mesh generations, element loads, output commands, and samples are presented. Author (ESA)

N86-20876# Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.
ICES STRUDL USER MANUAL. PART 3: DYNAMIC ANALYSIS
A. W. M. Kok Oct. 1984 76 p refs 3 Vol.
(B8575338-Pt-3) Avail: NTIS HC A05/MF A01

Modal analysis, Newmark BETA method, steady state, and response spectrum in the STRUDL program are covered. Mass properties, damping properties, loading specifications, dynamic analysis commands, output specifications, restart options, and samples are presented. Author (ESA)

N86-20877# Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.
ICES STRUDL USER MANUAL. PART 4: ANALYSIS OF NONLINEAR STRUCTURES
A. W. M. Kok and C. F. Vrijman Oct. 1984 38 p refs 6 Vol.

(B8575339-Pt-4) Avail: NTIS HC A03/MF A01

Linear buckling, geometrical nonlinear analysis of 2D and 3D frame structures, and a geometrical nonlinear plastic analysis of 2D frameworks with the STRUDL program are covered. The command language includes loading specifications, additional member properties, analysis commands, and restart options.

Author (ESA)

N86-20878# Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.

ICES STRUDL USER MANUAL. PART 5: SPECIAL OPTIONS

C. F. Vrijman and J. vanBeest Oct. 1984 65 p refs 6 Vol.

(B8575340-Pt-5) Avail: NTIS HC A04/MF A01

Shell elements, properties, and surface definitions with the STRUDL program are covered. Direct input of element stiffness matrix, extensions of element loads and joint loads, bandwidth reduction, restart options for large problems, routing of STRUDL data to user defined data sets, and samples are presented.

Author (ESA)

N86-20879# Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.

ICES STRUDL USER MANUAL. PART 6: COMMANDS AND ERRORS

A. deBoer and J. H. Voorrips Oct. 1984 87 p 6 Vol.

(B8575341-6-Pt-6) Avail: NTIS HC A05/MF A01

The command syntax of all STRUDL commands, arranged in alphabetical order, with a series of references to the Users Manuals part 1 to 5 is covered. A series of STRUDL error messages and warnings together with conditions and recommended actions is presented.

Author (ESA)

N86-20880# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.

DATA ACQUISITION OF IMPERFECTION MEASUREMENTS OF SHELLS TESTED AT THE DET NORSKE VERITAS RESEARCH LABORATORY

T. J. vanBaten Jul. 1983 17 p refs

(VTH-M-447) Avail: NTIS HC A02/MF A01

Data acquisition from a tape containing the results of imperfect shape and buckling mode measurements of shells is described. The data were recorded on magnetic tape using an A/D converter. A FORTRAN program was written and made operational on an Amdahl 470 V/7B digital computer to read and interpret the data and to convert them to the format of the Imperfection Data Bank.

Author (ESA)

N86-20881# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.

THE STABILITY AND VIBRATION CHARACTERISTICS OF A UNIVERSAL JOINT-SUSPENDED RIGID BODY

W. P. Koppens Mar. 1983 28 p refs

(VTH-M-461) Avail: NTIS HC A03/MF A01

The stability and vibration characteristics of a steady rotating rigid body suspended by a universal joint are investigated. A rigid body suspended by a steady rotating universal joint (rotations of the internal gimbal and the rigid body are elastically restrained) and a steady rotating rigid body, suspended by a universal joint (rotations of the internal and external gimbal are elastically restrained) are compared. It is concluded that the regions of stability of both cases coincide when the spring stiffnesses are equal. Depending on the mass distribution of the body, the elastic connections can be stabilizing or destabilizing. The frequency paths are identical for both cases.

Author (ESA)

N86-20882# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.

STABILITY OF SHELL WITH STOCHASTIC INITIAL IMPERFECTIONS PROJECT Progress Report

P. G. Vermeulen Jun. 1983 17 p refs Sponsored by Stichting Technische Wetenschappen

(VTH-M-471; PR-2) Avail: NTIS HC A02/MF A01

The simulation of initial shell imperfections via the Monte Carlo method was studied. The method for tracing possible errors or inaccuracies in the different steps made to generate the reliability functions is presented. The influence of the sample size on the sample mean vector and sample covariance matrix and their confidence intervals is examined. The statistical model used for the initial imperfections is explained.

Author (ESA)

N86-20883# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.

OVERALL BUCKLING OF Z-STIFFENED PANELS IN COMPRESSION, PART 2

A. vanderNeut Sep. 1983 8 p refs

(VTH-M-485-Pt-2) Avail: NTIS HC A02/MF A01

A correction to van der Neut (1980) Overall buckling of Z-stiffened panels in compression is presented. The error is an inconsistency when accounting for the lateral load of the flange (in the direction of z). Section 3.3 gives this load per unit of length of x correctly as - p d A (W - Phi 2 y)". However the shear force on the total cross section of stringer and plate is given by equation (3.6) as D = PW", thus neglecting the Phi 2 contribution to the shear force. The correct expression for D is D = P (W - S/A Phi 2)'. Also, it is better to use the complete plate equation rather than replacing it by the strip equation (2.2).

Author (ESA)

N86-20884# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.

INITIAL IMPLEMENTATION OF THE LEVEL 2 APPROACH TO THE STOCHASTIC BUCKLING OF SHELLS

P. G. Vermeulen Jan. 1984 10 p refs Sponsored by Stichting voor de Technische Wetenschappen

(VTH-M-503) Avail: NTIS HC A02/MF A01

It is shown that the Level 2 method can be used for determining the reliability function of axially compressed shells. The number of buckling load calculations is significantly less then with the Monte Carlo method. The mean buckling load of both methods are in good agreement, but still considerably higher than the experimental value. This is mainly caused by the buckling load analysis. Since the Level 2 method does not need so many calculations, using a more advanced and expensive method can be considered. The reliability functions of both methods are in good agreement, but the Level 2 method is more critical in the higher reliability region.

Author (ESA)

N86-20885# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.

FIRST ORDER SECOND MOMENT ANALYSIS OF THE BUCKLING OF SHELLS WITH RANDOM IMPERFECTIONS

I. Elishakoff (Technion Univ., Haifa, Israel), S. vanManen (TNO-Inst. for Building Materials and Structures, Rijswijk, Netherlands), P. G. Vermeulen (Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost, Netherlands), and J. Arbocz 13 Nov. 1985 20 p refs Sponsored by Stichting voor de Technische Wetenschappen

(VTH-M-526) Avail: NTIS HC A02/MF A01

First order second moment analysis for nominally circular cylindrical shells possessing axisymmetric and general nonsymmetric random imperfections is given. Results of measurements of initial imperfection Fourier coefficients are used to construct their second order statistical properties. The MIUTAM computer code is applied for determination of buckling loads. Results of reliability calculations are found to be in good agreement with those of the Monte Carlo method.

Author (ESA)

N86-20886# California Inst. of Tech., Pasadena. Earthquake Engineering Research Lab.

CUMULATIVE DAMAGE OF STRUCTURES SUBJECTED TO RESPONSE SPECTRUM CONSISTENT RANDOM PROCESSES Ph.D. Thesis

G. D. Jeong 1985 121 p

(Grant NSF CEE-81-19962)

(PB86-100807; EERL-85-03) Avail: NTIS HC A06/MF A01 CSCL 13M

A theoretical analysis of the effect of duration on the damage of structures subjected to earthquakes is presented. Earthquake

excitation is modeled as a nonstationary random process. Estimates of the first-passage probability of a simple oscillator are employed to choose modulated Gaussian random processes consistent with a prescribed response spectrum. Expressions for the mean damage of a structure are derived using an approach similar to the Miner-Palmgren rule for failure caused by cyclic loads. The expected damage expressions are then evaluated for structure subjected to modulated Gaussian random processes of varying duration. Two types of structures are examined: a steel structure and a reinforced concrete structure. Author (GRA)

N86-20594# Naval Civil Engineering Lab., Port Hueneme, Calif.
DESIGN CRITERIA AND PRELIMINARY ACCEPTANCE TEST SPECIFICATIONS FOR BLAST RESISTANT WINDOWS
G. E. Meyers *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 153-214 (For primary document see N86-20589 11-31)
(AD-P004825) Avail: NTIS HC A99/MF E03 CSCL 19/4

N86-20603# Army Materiel Command, Aberdeen Proving Ground, Md.
REFLECTED OVERPRESSURE IMPULSE ON A FINITE STRUCTURE
G. A. Coulter and C. N. Kingery *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 325-364 (For primary document see N86-20589 11-31)
(AD-P004834) Avail: NTIS HC A99/MF E03 CSCL 19/4

N86-20605# Southwest Research Inst., San Antonio, Tex.
EFFECTS OF COMBUSTIBLES ON INTERNAL QUASI-STATIC LOADS
N. R. Sandoval, J. C. Hokanson, E. D. Esparza, and W. E. Baker *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 395-415 (For primary document see N86-20589 11-31)
(AD-P004836) Avail: NTIS HC A99/MF E03 CSCL 19/4

N86-20606# Army Materiel Command, Aberdeen Proving Ground, Md.
BLAST LOADING ON ABOVE GROUND BARRICADED MUNITION STORAGE MAGAZINES
G. Bulmash and C. N. Kingery *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 417-464 (For primary document see N86-20589 11-31)
(AD-P004837) Avail: NTIS HC A99/MF E03 CSCL 19/4

N86-20607# Tooele Army Depot, Utah.
SHIELD/BARRICADE TESTING AT AED (AMMUNITION EQUIPMENT DIRECTORATE)
J. R. Miller *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 465-469 (For primary document see N86-20589 11-31)
(AD-P004838) Avail: NTIS HC A99/MF E03 CSCL 19/4

N86-20613# Prins Maurits Lab. TNO, Rijswijk (Netherlands).
THE FAILURE MODE OF LAYERED CONCRETE CONSTRUCTION DUE TO CONTACT CHARGES
J. Weerheijm, W. Karthaus, and G. Opschoor *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 581-596 (For primary document see N86-20589 11-31)
(AD-P004846) Avail: NTIS HC A99/MF E03 CSCL 19/4

N86-20614# IIT Research Inst., Chicago, Ill.
FAILURE ANALYSIS OF STRUCTURES SUBJECTED TO MULTIPLE BLAST LOADS
A. Longinow, J. Mohammadi, and H. S. Mapadensky *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 1 Aug. 1984 p 597-604 (For primary document see N86-20589 11-31)
(AD-P004847) Avail: NTIS HC A99/MF E03 CSCL 19/4

N86-20626# Naval Civil Engineering Lab., Port Hueneme, Calif.
YIELD-LINE ANALYSIS OF RECTANGULAR LABS WITH DOORS
P. Wager and S. Berkenbile IN Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 2 Aug. 1984 p 1149-1164 (For primary document see N86-20623 11-31)
(AD-P004783) Avail: NTIS HC A99/MF E01 CSCL 13/12

42 GEOSCIENCES (GENERAL)

N86-20887# Joint Publications Research Service, Arlington, Va.
USSR REPORT: EARTH SCIENCES
10 Jan. 1986 61 p Transl. into ENGLISH from various Russian articles
(JPRS-UES-86-001) Avail: NTIS HC A04

Program developments research and management and research and development in Earth sciences in the USSR are reported. Categories discussed include: meteorology, oceanography, terrestrial geophysics, upper atmosphere physics, and research in the arctic and antarctic regions. For individual titles, see N86-20888 through N86-20929.

N86-20888# Joint Publications Research Service, Arlington, Va.
AN-30 PHOTOGRAPHY AIRPLANE OUTFITTED FOR CLOUD-SEEDING MISSIONS c47
T. Kuznetsova and A. Pimenov *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 1-2 Transl. into ENGLISH from Pravda Ukrainy (Kiev, USSR), 15 Aug. 1985 p 4 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

The development of the AN-30M airplane mode, which can modify the weather is discussed. It has excellent flight qualities, high reliability, and modern pilotage-and-navigation equipment that permits flight routes and course changes in the semiautomatic mode and takeoffs during daytime and nighttime, in difficult weather conditions. Ammunition against precipitation (crystalline and other reagents) is loaded into containers placed inside and outside the aircraft on external mounts with a streamlined shape. The instruments evaluate weather conditions outside the airplane and decide at what altitude the cloud cover should be seeded and on the methods to be used. The AN-30M seeds clouds with frozen carbon dioxide granules. The plane can induce additional rainfall on farmlands, increase snow cover, and extinguish forest fires. E.A.K.

N86-20889# Joint Publications Research Service, Arlington, Va.
FACILITY FOR MODELING ORIGINS OF TYPHOONS c47
A. Melnikov *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 3-4 Transl. into ENGLISH from Pravda (Moscow, USSR), 8 Jul. 1985 p 7 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

A facility for prediction of typhoons, and their origins is discussed. The mechanism which puts massive air flows in motion is examined. The hydrodynamic properties of typhoons are analyzed and a facility for modeling whirlwind formations is presented. The facility is a large cylindrical tank where ocean-atmosphere interaction is simulated by heating its water content. Above it, a motion picture camera is mounted which record processes taking place inside the tank. A laser attachment which creates a bright blue screen above the water detects these processes. The screen is the effect of a flattened-out laser beam, which provides a cross-section of the whirlwind flows that arise. The data together with aerospace photographs determine with greater accuracy the parameters and the pressure in the center of a tropical cyclone, and the maximum wind zones. E.A.K.

N86-20890# Joint Publications Research Service, Arlington, Va.
METEOROLOGICAL ADAPTATION RESEARCH AT BIOLOGY

INSTITUTE Abstract Only **c51**
Ye. Krushelnitskiy *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 5-6 Transl. into ENGLISH from Trud (Moscow, USSR), 26 Sep. 1985 p 3 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

Natural mechanisms of anticipation of weather changes in animals and human beings, and effects of weather conditions on human behavior and working fitness were studied. Meteorological sounds on the noise of free atmosphere caused by turbulent motion of the air. It is perceived by living organisms as sounds, analyzed by them and their behavior is modified accordingly. The biological forecasting mechanism may lead to the development of improved weather-forecasting methods and equipment. An acoustic weather-forecasting method was ued. Cloudiness and precipitation reportedly were forecast with accuracies of 98% and 85 percent using this method. A medical forecasting method using primary data, which is based on the meteorological-adaptation hypothesis was developed. Ecological factors are considered in the forecasting and prevention of illness. E.A.K.

N86-20891# Joint Publications Research Service, Arlington, Va.
WORK ON MATHEMATICAL MODELING OF TROPICAL STORMS WAKES Abstract Only **c47**
A. Yakovlev *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 7 Transl. into ENGLISH from Gudok (Moscow, USSR), 29 Sep. 1985 p 4 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

Effects of the formatijon of tropical storms on the surface waters of the ocean were studied. It was discovered that a tropical storm leaves a wake a strip of cooled water which remains in surface waters for as long as several weeks after a storm has passed. The structure of storms' wakes is studied to evaluate energy-conversion processes which occur during tropical storms, in order to forecast their behavior. A physical-mathematical model of the wake of a storm is developed which predicts the intensity and direction of a spawning storm by calculating a model of its wake on a computer from point of origin, initial velocity, and certain energy factors. E.A.K.

N86-20892# Joint Publications Research Service, Arlington, Va.
RESEARCH SHIP ZUBOV TO LAUNCH WEATHER ROCKETS IN ATLANTIC **c46**
T. Volgina *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 10 Transl. into ENGLISH from Leningradskaya (Leningrad, USSR), 14 Aug. 1985 p 4 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

Hydrometeorology and monitoring of the natural environment, are reported. Probing of the upper layers of the atmosphere with rockets over the Atlantic is discussed. Series of meteorological rockets equipped with scientific apparatus are launched over the ocean at several points. The rockets will soar to altitudes as high as 80 kilometers in the planet's atmosphere. Important data on the structure and dynamics of the upper layers of the atmosphere and of the ionosphere are obtained in this manner. Physical processes occurring in near-earth space in conditions of minimal solar activity are studied. E.A.K.

N86-20893# Joint Publications Research Service, Arlington, Va.
HYDROPHYSICAL STUDIES FROM SHIP VEYMER IN NORTH ATLANTIC **c47**
In its USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 11 Transl. into ENGLISH from Sovetskaya Belorussiya (Minsk, USSR), 13 Aug. 1985 p 4 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

Velocities of water masses at various depths in the Gulf Stream and near the island of Newfoundland off the coast of Canada were measured from ship. Cyclones systematically give rise to active transfer of heat from the surface of the water to the atmosphere in these areas. These cyclones carry warm masses of air to the European continent, shaping its climate. Understanding regularities involved in the variability of hydrophysical fields in the Atlantic provides guaranteed forecasts for the season and even for a year in advance. E.A.K.

N86-20894# Joint Publications Research Service, Arlington, Va.
PORT APPARATUS FOR REMOTE DETECTION OF SEA ROUGHNESS **c48**
In its USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 12 Transl. into ENGLISH from Sovetskaya Litva (Vilnius, USSR), 24 Jul. 1985 p 4 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

Port waters and mooring places, and the direction of the wind and of underwater currents that most often form cyclones, were configurated. An apparatus for remote detection of waves that roll in from time to time was developed. At any time of the day, roughness of the sea is detected several days in advance and its duration, direction, intensity and other parameters are forecasted with the aid of this unit. Special programs were developed whose data will be processed by a computer. E.A.K.

N86-20895# Joint Publications Research Service, Arlington, Va.
DEVICE FOR ANALYZING UNDERWATER TV PICTURES WITH IR CAPABILITY **c48**
A. Isayev *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 14 Transl. into ENGLISH from Trud (Moscow, USSR), p 3 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

An automatic device for analyzing underwater pictures was developed. The automatic device has a memory with which it can be programmed to discern ferromanganese nodules from other objects on the sea bottom. One of its big advantages is the adaptation to its environment. The device sees infrared rays which is valuable for the determination of the temperature at deep sea levels. The device recommended for underwater navigation, plotting courses for adaptive submersible robots operating at various levels or on the sea bottom. E.A.K.

N86-20896# Joint Publications Research Service, Arlington, Va.
LONG-TERM PROGRAM TO STUDY OCEAN'S ENERGY-ACTIVE ZONES DESCRIBED Abstract Only **c48**
S. Lappo *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 18 Transl. into ENGLISH from Kommunist (Yerevan, USSR), 11 Sep. 1985 p 3 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

Ocean-atmosphere interaction was studied to gain a better understanding of short-term fluctuations in climate. Identified energy-active zones of the world's oceans where the exchange of heat between ocean and atmosphere is most intensive were analyzed. The following items are studied: (1) climatic processes of the large-scale interactior of the atmosphere, ocean and continents in regions of energy-active zones; (2) temporary variability of basic characteristics of the ocean and atmosphere in energy-active zones; and (3) the connection between thermal and dynamic anomalies in these zones and the formation of air-circulation anomalies above the ocean and continents. The following energy-active zones are identified: the Norwegian-Greenland zone, the Newfoundland zone, the Gulfstream Current zone, the Atlantic tropical zone, and the Japan Current zone. E.A.K.

N86-20897# Joint Publications Research Service, Arlington, Va.
HYDROPHYSICAL EXPERIMENT MEZOPOLIGON-85 IN TROPICAL ATLANTIC **c48**
V. Titov *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 19 Transl. into ENGLISH from Vodnyy Transport (Moscow, USSR), 1 Oct. 1985 p 4 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

A hydrophysical experiment called 'mezopoligon-85', was conducted. Problems of the interaction of large synoptic eddy

currents and the water surrounding them were studied. The author relates that a survey area 220 kilometers square in the tropical Atlantic was selected for the experiment. Physical and chemical properties of the water were measured from the surface of the ocean down to 1,500 meters. Two large eddy currents were found in the survey area. Each of them is approximately 80 miles in diameter, and they rotate in opposite directions and touch each other. In the layer of ocean between the 900 and 1,300-meter levels, the expedition discovered a lens of a water mass about 30 miles in diameter, whose properties were completely different from those of the surrounding water. E.A.K.

N86-20898# Joint Publications Research Service, Arlington, Va.
SEASONAL SOURCES OF THERMOHALINE CIRCULATION IN NORTH ATLANTIC Abstract Only **c48**
L. I. Galerkin, A. S. Monin, and S. V. Sergunin *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 20 Transl. into ENGLISH from Doklady Akademii Nauk SSSR (Moscow, USSR), v. 282, no. 3, May 1985 p 705-708 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

The diurnal and seasonal variations of temperature and currents over most of the ocean caused by thermal and mechanical inertia of the ocean small however some characteristics experience considerable seasonal variations, especially the effect of the atmosphere on the ocean: vertical flows of heat and salt at its surface and especially their combination. The map of M values was based on the mean annual components of the heat and water budgets of the ocean surface. The results are given of computations of the annual variation of M values in 11 5 grid squares in the main currents, in dynamic zones and on the periphery of the subtropical anticyclonic circulation in the North Atlantic on the basis of mean monthly long term P (rate of falling of precipitation), R (radiative heat flow), relative humidity f, wind speed u, water and air temperature (sub, T sub) values. The results of the computations are tabulated. It is noted that earlier computations based on mean annual meteorological data considerably exaggerated the mean annual M values and sometimes even distorted their signs, indicating that the role of seasonal variations is extremely great. E.A.K.

N86-20899# Joint Publications Research Service, Arlington, Va.
MECHANISM OF FIXATION OF Mn AND Fe ON SURFACE OF FERROMANGANESE NODULES Abstract Only **c26**
A. A. Morozov *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 21 Transl. into ENGLISH from Doklady Akademii Nauk SSSR (Moscow, USSR), v. 282, no. 3, May 1985 p 688-692 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

The formation of torromanganese nodules attributed to the specifics of the chemical properties of Mn forms existing in the ocean: Mn(II) and M2O2. The structure of colloidal-disperse particles of hydrated M2On and their fixation on the nodule surface were studied. Factors involved in nodule formation are reviewed and a number of possible variants are considered. A model of the mechanism of formation of the nodule or body is proposed. A chemical interaction can arise due to the appearance of reduced forms of Mn and Fe, whose hydroxides, in contrast to hydroxides of oxidized forms, have a well-expressed basic character. A positive charge appears on the surface. This gives rise to the possibility of electrostatic attraction, contact and chemical redox interactions between different Mn and Fe forms. E.A.K.

N86-20900# Joint Publications Research Service, Arlington, Va.
NUCLEAR PHYSICAL METHODS FOR DETERMINING CARBON IN OCEANIC SUSPENSIONS Abstract Only **c73**
I. Ya. Barit, L. Ye. Kuzmin, and B. A. Shnykin *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 22 Transl. into ENGLISH from Doklady Akademii Nauk SSSR (Moscow, USSR), v. 282, no. 3, May 1985 p 587-590 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

Nuclear physical methods to determine the total carbon content in oceanic suspensions using the reactions C-12 (d, p) sup C-13 and C-12 (d, n) sup N-13 are described. The methods are based on new techniques for preparing samples for analysis involving a transfer of suspended matter from the filter onto a metallic backing with a low C content by pressing and subsequent removal of the filter. Most of the suspended matter is transferred equivalent fractions, biogenous and terrigenous, whose particles have a different capacity for adhesion to the filter material. It is found that the transfer is complete. The results of determination of C content in suspension samples are given. The tabulated data contain a correction for pollution by the backing (contamination factor). E.A.K.

N86-20901# Joint Publications Research Service, Arlington, Va.
FLUCTUATIONS IN PROPAGATION TIME AND DIRECTION OF ARRIVAL OF SIGNAL REFLECTED FROM WAVE-COVERED SEA SURFACE Abstract Only **c71**
V. M. Frolov *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 22-23 Transl. into ENGLISH from Izvestiya Nauk SSSR: Fizika Atmosfery I Okeana (Moscow, USSR), v. 21, no. 7, Jul. 1985 p 768-774 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

The two dimensional problem of finding fluctuations in propagation time, angle of arrival and intensity of sound experiencing multiple reflection from the surface of a stratified ocean was solved by the author in an earlier study (AKUST. ZHURN., Vol 31, No 1, pp 103-110, 1185). A three-dimensional case of single reflection in a geometroacoustical approximation with ray refraction neglected. The development of a method to determine the parameters is studied of the wavecovered sea surface was studied. Formulas are derived for determining the averaged characteristics of a signal arriving at a directional antenna from such a spot: fluctuations of signal propagation time and the direction of its arrival and the spatial-temporal correlation of these characteristics. A number of simplifying assumptions are made. Incidence of spherical and plane waves on the scattering surface, and a narrow collimated beam, are examined. A narrow collimated beam are examined. Recommendations are given on how to determinate the characteristics of sea waves from measurements of these fluctuations. E.A.K.

N86-20902# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF TAYLOR-HOGG CONE ON DENSITY FIELD STRUCTURE IN STRATIFIED OCEAN WITH PYCNOCLINE Abstract Only **c48**
M. B. Timonov and N. K. Shelkovnikov *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 23 Transl. into ENGLISH from Izvestiya Akademii Nauk SSSR: Fizika Atmosfery I Okeana (Moscow, USSR), v. 21, no. 7, Jul. 1985 p 752-758 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

The influence of stratification of the lower layer, density drop in the pycnocline and ratio of thicknesses of the upper and lower layers on pycnocline position was studied. It was found that the isolines of the functions for disturbances of the pycnocline and density field in the lower layer do not coincide with the isolines of the stream function. Pycnocline deformations are also observed when the flow contains no closed stream lines (Taylor-Hogg cone). It is shown that rising of the pycnocline over an underwater obstacle is caused by the existence of a region of anticyclonic vorticity above it; pycnocline deformation is very significant and easily detected. This effect can be used in study of Taylor eddies in the ocean and in determining promising fishing areas. E.A.K.

N86-20903# Joint Publications Research Service, Arlington, Va.
MASLOV OPERATOR METHOD IN PROBLEM OF WAVES IN WATER GENERATED BY SOURCE MOVING OVER UNEVEN BOTTOM Abstract Only **c48**
S. Yu. Dobrokhotov and P. N. Khevandrov *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 24 Transl. into ENGLISH from Izvestiya Akademii Nauk SSSR: Fizika Atmosfery I Okeana (Moscow, USSR), v. 21, no. 7, Jul. 1985

p 744-751 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

A wedge of waves behind a source moving over a fluid surface is a result of the Cerenkov radiation of waves in a dispersive medium. Linear differential equations in which the moving soruce is represented in the form of a Dirac delta function described this phenomenon. In a homogeneous medium, the coefficients in the corresponding equations are constant and after application of the Fourier of Laplace transforms they are reduced to ordinary differential or algebraic equations. The problem of Cerenkov radiation of waves in water involves a system whose precise or approximate solution is impossible. If the depth changes slowly the waves generated by the source are short in comparison with the characteristic scale of depth change. In such a case asymptotic formulas can be used for describing Cerenkov radiation. These formulas are derived by nonstandard characteristics the Maslov operator method. A method was developed reducing construction of the asymptotic form of solution of the initial problem to an analytical or numerical solution or systems of ordinary differential equations in partial derivatives. The Maslov approach is applied to compute the wave patterns during motion of a source over some specific bottom profiles along different trajectories. E.A.K.

N86-20904# Joint Publications Research Service, Arlington, Va.
EVALUATION OF COEFFICIENTS OF HEAT AND MOISTURE EXCHANGE BETWEEN OCEAN AND ATMOSPHERE Abstract Only **c48**
V. V. Yefimov, N. A. Timofeyev, Ye. N. Sychev, and I. V. Kurzheyevskiy *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 24-25 Transl. into ENGLISH from Izvestiya Akademii Nauk SSSR: Fizika Atmosfery I Okeana (Moscow, USSR), v. 21, no. 7, Jul. 1985 p 735-743 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

The heat budget of the Black Sea was determined by generalization of about 60,000 series of standard shipboard hydrometeorological observations carried out between 1891 and 1966, supplemented by additional archival data for 1967 to 1975 and all hydrological information collected between 1880 and 1973. The mean monthly and annual values of components of the external heat budget were computed for 60 elementary squares and then averaged for the entire area of the Black Sea. The tabulated and integrated data for flows of momentum, heat and moisture between the ocean and atmosphere are compared with corresponding values obtained using standard formulas. It is found that there is an understatement of the fluxes of heat and moisture computed using these formulas in comparison with the experimental data. Values are proposed for the constant components and computation formulas and for the variable exchange coefficients which are most consistent with in situ data. E.A.K.

N86-20905# Joint Publications Research Service, Arlington, Va.
ESTIMATING DENSITY INHOMOGENEITY OF UPPER MANTLE UNDER ATLANTIC OCEAN USING DATA FROM COMPREHENSIVE REGIONAL GEOPHYSICAL RESEARCH Abstract Only **c48**
A. V. Ladynin, E. M. Litvinov, and S. P. Mashchenkov *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 25 Transl. into ENGLISH from Geologiya I Geofizika (Novosibirsk, USSR), no. 5, May 1985 p 93-103 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

Ways to estimate lateral density inhomogeneities in the upper mantle were reviewed and a method for determining density in the lithospheric layer between the crust and asthenosphere, was presented. Density inhomogeneity of the Atlantic Ocean upper mantle based on the mentioned method, was studied. Isostasy prevails virtually everywhere, crustal structural inhomogeneities detected by deep seismic sounding; seismology and gravimetry, together with upper mantle inhomogeneities, are mutually compensated. It is shown with a density model of the crust that it is possible to evaluate lateral variations of upper mantle density. The main role in upper mantle density structure is played by inhomogeneities of its lithospheric part, but asthenospheric inhomogeneities are also considered. Data on bottom bathymetry, seismic data on crustal structure, gravimetric: (1) crustal thickness under Atlantic Ocean coefficients for compensating Atlantic Ocean bottom relief masses; (2) corrected depths of Moho in isostatic model; (3) density distribution in upper mantle lithospheric layer; and (4) lateral changes in asthenospheric density. E.A.K.

N86-20906# Joint Publications Research Service, Arlington, Va.
STRUCTURE OF SEDIMENTARY COVER OF RED SEA DETERMINED FROM SEISMIC DATA Abstract Only **c46**
I. N. Yelnikov and L. P. Zonenshayn *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 26 Transl. into ENGLISH from Geotektonika (Moscow, USSR), no. 4, Jul. - Aug. 1985 p 110-122 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

The continuous seismic profiling method was used in a region of study of the Red Sea rift and on regional runs along the edges of the Red Sea rift and across it to the south and north of the region. Clearly defined southern and northern parts of the sea were found. The southern part has a well-expressed zonality in structure of the sedimentary cover. Evaporites developed along the edges of the Red Sea depression and are absent in a central zone with a width of about 50 km and an extent not less than 750 km. Only the upper, Pliocene-Quarternary sedimentary stratum with a thickness up to 300 m has developed in this central zone. Within it is a narrower axial rift zone without significant thicknesses of sediments. Three zones in the cross section of the southern part of the Red Sea rift coincide well with tectonic zonality in the rift. The marginal parts, underlain by evaporites correspond to more ancient parts of the rift formed during the first phase of spreading; its central part, without evaporites, corresponds to the younger bed of the rift formed during the second phase of spreading; the narrow axial zone, without sediments, coincides with the zone of the most recent volcanism and most recent dilatation. The difference between the southern and northern parts of the Red Sea is that in the south the thick evaporite layer, was broken, whereas in the north it was not. E.A.K.

N86-20907# Joint Publications Research Service, Arlington, Va.
PATTERNS OF RELATIVE POSITIONING OF OCEANIC RIFTS AND TRANSFORM FAULTS Abstract Only **c46**
N. Yu. Bocharova, Ye. G. Mirlin, and K. V. Popov *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 26-27 Transl. into ENGLISH from Geotektonika (Moscow, USSR), no. 4, Jul. - Aug. 1985 p 100-109 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

The general patterns of relative arrangement of rift zones and transform faults in the ocean were studied. The geological-geophysical materials for the crests of mid-oceanic ridges fall into three categories: (1) data on structure of oceanic rift zones and transform faults; (2) bathymetric and geophysical maps for regions explored in detail; (3) bathymetric maps at 1:2,000,000 and 1:5,000,000. These materials were used in determining the parameters of 360 active transform faults. The quantitative characteristics of each of these faults were catalogued. Distance between transform faults was determined, lengths of active parts of these faults were ascertained, the angular relationships between rift zones and transform faults were calculated. It is concluded that the distribution of the quantitative characteristics of the geometry of the axis of spreading of plates in the ocean is clearly dependent on the spreading rate. The thermal regime of the lithosphere exerts a decisive influence on the geometry of the axis of spreading of plates. E.A.K.

N86-20908# Joint Publications Research Service, Arlington, Va.
ACOUSTIC FIELD IN UNDERWATER WAVEGUIDE WITH RANDOM INHOMOGENEITIES Abstract Only **c71**
A. G. Nechayev *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 27-28 Transl. into ENGLISH from Akusticheskiy Zhurnal (Moscow, USSR), v. 31, no. 3, May - Jun. 1985 p 358-364 (For primary document see N86-20887

11-42)
Avail: NTIS HC A04

The representation of the acoustic field in the horizontal plane in the form of a wave beam and the approximation of a Markov random process, are applied to an analysis of signal propagation in an underwater waveguide with random volmetric irregularities. It is shown that with a large number of pairs of modes satisfying the synchronism condition the interference structure is determined by the mean field, and by partial coherent of the random components of normal waves and because of this attenuates to a considerably lesser degree than the coherent field. Under certain conditions, however, the interference structure is determined only by the coherent field. E.A.K.

N86-20909# Joint Publications Research Service, Arlington, Va.
DETERMINING UNIVERSAL HIGH-FREQUENCY ASYMPTOTIC SPECTRAL FORMS ASSOCIATED WITH PROPAGATION OF INTENSIVE ACOUSTIC NOISE Abstract Only **c71**
L. Bjorno and S. N. Gurbatov *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 28 Transl. into ENGLISH from Akusticheskiy Zhurnal (Moscow, USSR), v. 31, no. 3, May - Jun. 1985 p 303-308 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

The process of appearance of high-frequency asymptotic forms of the energy spectrum of noise in media with weak dispersion and attenuation was studied. Data on the propagation of intensive acoustic noise in air-filled pipes where the appearance of dispersion is associated with the influence of near-wall viscosity are compared. It is shown that there is a power-law dropoff of the spectrum which is associated with field characteristics. Transformation of the noise spectra in different sections indicates in the direction of the lower frequencies as the wave propagates. The appearance of some universal spectral form and a loss of information on fine structure of the spectrum in an ever-broader frequency range are observed. It is postulated that the experimentally observed transformation of the spectrum is the initial stage in appearance of a self similar structure of the spectrum of intensive acoustic noise. E.A.K.

N86-20910# Joint Publications Research Service, Arlington, Va.
DIFFERENTLY DIRECTED MOVEMENTS OF GAS BUBBLES IN VIBRATING FLUIDS IN PRESENCE OF PHYSICAL INHOMOGENEITIES Abstract Only **c71**
N. A. Pelykh *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 28 - 29 Transl. into ENGLISH from Prikladnaya Mekhanika (Kiev, USSR), v. 21, no. 6, Jun. 1985 p 100-107 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

A multiphase medium constituting a mixture of gas inclusions of different sizes in a carrier fluid of a given density filling a rigid vessel which experiences oscillations in a longitudinal direction was studied. The dynamic behavior of bubbles of two sizes relative to a noninertial coordinate system was examined. A transparent cylindrical vessel with a homogeneous fluid or two unmixing fluids of different density to study the movement of gas bubbles. It is shown that a repulsion level exists in one of the layers of fluid. Bubbles of identical size situated close to this level on either side either float up or sink to the bottom. In the case of motion of bubbles greatly differing in size, the initial position of bubbles of different size is the same but their behavior is different. Small bubbles sink whereas large bubbles float up. E.A.K.

N86-20911# Joint Publications Research Service, Arlington, Va.
GEOCHEMISTRY DISCOVERY OPENS WAY TO NEW MINING OF RARE METALS **c26**
Sh. Muladzhanov *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 32-33 Transl. into ENGLISH from Moskovskaya (Moscow, USSR), 20 Sep. 1985 p 1 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

The nature of separation of analog-elements that make up the hard-to-separate pairs (niobium-tantalum, aluminum-silicon, was analyzed. It was shown by geochemical procedures that large agglomerations of many rare and even ultrarare elements exist. Specific geological investigations showed objects with maximum separation of many rare analog-elements, with agglomerations of tantalum, yttrium and other rare-metal elements that were previously unknown to science. The new techniques caused new commercial types of ores to appear in the arsenal of the extraction industry. Major commercial-scale deposits of tantalum, zirconium and other rare metals are now mapped of the USSR, Mongolia and other countries. Author

N86-20912# Joint Publications Research Service, Arlington, Va.
RADIOMETRIC AIRBORNE MOISTURE METER **c35**
M. Gusev *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 34 Transl. into ENGLISH from Trud (Moscow, USSR), 19 Jul. 1985 p 4 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

The moisture meter is an instrument which gives accurate recording of the presence of moisture in the ground from an airplane. With the aid of the meter, the reasons for the flooding of three settlements with ground water were established and the place where the ground water was accumulating was discovered. As the temperature of the ground changes, changes also occur in the boundaries of this spectrum and the ground's radiation-brightness temperature which vary according to the amount of moisture. The instrument measures the ground's radiation brightness temperature. E.A.K.

N86-20913# Joint Publications Research Service, Arlington, Va.
THEORY OF FIELD PROPAGATION ADVANCES MHD PROBING OF EARTH'S CRUST **c35**
M. Savin *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 36-37 Transl. into ENGLISH from Izvestiya (Moscow, USSR), 11 Sep. 1985 p 3 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

Magnetohydrodynamic (MHD) generators can develop unprecedented power surges in seconds. With a MHD generator it is possible to probe the Earth's crust to a depth of 50 kilometers. The generator's penetrating field is reflected from deep-level geophysical boundaries and carries information to the Earth's surface. A mathematical theory of the propagation of pulsed electromagnetic fields in the material of the Earth's crust was constructed. The results from geophysical MHD generators provide reliable information on physical properties of the lower levels of the Earth's crust. It is possible to look into even greater depths of the planet the mantle by studying variations of the Earth's natural electromagnetic field. E.A.K.

N86-20914# Joint Publications Research Service, Arlington, Va.
EXPERIMENTS TO RECORD GRAVITATIONS **c93**
In its USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 38-39 Transl. into ENGLISH from Sotsialisticheskaya Industriya (Moscow, USSR), 4 Jul. 1985 p 4 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

The development of a gravitational laser (graser) is reported. Harmonious seismic oscillations of unexplained origin were examined. Their frequency [may be] a multiple of the frequencies of oscillations of pulsars near the planet. The periodicity of the recorded signals indicated that the source of seismic oscillations was of extraterrestrial origin. The effects were the result of gravitational waves generated by pulsars. E.A.K.

N86-20915# Joint Publications Research Service, Arlington, Va.
EARTH PHYSICIST DESCRIBES US NUCLEAR TEST MONITORING SYSTEM Abstract Only **c73**
In its USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 40 Transl. into ENGLISH from Izvestiya (Moscow, USSR), 23 Aug. 1985 p 5 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

The U. S. capabilities to monitor underground nuclear weapons

tests in the USSR was examined. American methods used in monitoring the underground nuclear tests are enumerated. The U. S. technical means of monitoring Solviet nuclear weapons testing, and whether it is possible to conduct tests that could not be detected by these means are examined. The worldwide seismic station network in 55 countries available to the U. S. for seismic detection and measurement of underground nuclear explosions, and also the systems of seismic research observatories in 15 countries and seismic grouping stations in 12 countries are outlined including the advanced computerized data processing capabilities of these facilities. The level of capability of the U. S. seismic system for monitoring nuclear tests, other, nonseismic means of monitoring, such as hydroacoustic and recording of effects in the atmosphere, ionosphere, and the Earth's magnetic field, are discussed. E.A.K.

N86-20916# Joint Publications Research Service, Arlington, Va.
RADON AS INDICATOR OF PERMEABILITY ZONES FOR STEAM HYDROTHERMS Abstract Only **c46**
A. M. Rozhkov *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 41 Transl. into ENGLISH from Vulkanologiya I Seysmologiya (Moscow, USSR), no. 3, May - Jun. 1985 p 78-82 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

The importance of increasing the efficiency in reconnaissance exploration work for high-temperature waters, searching for hidden centers of discharge of steam hydrotherms and the choice of optimum sites for test holes is discussed. Radon is an indicator of modern hydrothermal processes and its distribution can be used in outlining the areal distribution of hydrotherms and also heat-conducting fissured zones. The individual profiles and small sectors of the areal survey of hydrothermal deposits do not give a full picture of the patterns and distribution of radon anomalies over the entire area of the deposit. It was found that the radon concentrations were greater than the background radon concentrations in soil air. Radon anomalies occupy more than half the tested area and coincide with a series of northwesterly faults. A distinguishing feature of these sectors is their concentric arrangement relative to the caldera. E.A.K.

N86-20917# Joint Publications Research Service, Arlington, Va.
EXPERIENCE WITH SURFACE IR SURVEY FOR ESTIMATING TEMPERATURE AND HEAT RADIATION OF THERMAL FIELDS OF MUTNOVSKIY VOLCANO (KAMCHATKA) Abstract Only **c35**
B. G. Polyak, B. A. Bezukh, V. I. Kaftan, A. I. Kuzmin, Yu. D. Kuzmin, V. Ye. Stelmashok, and V. P. Turkov *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 41-42 Transl. into ENGLISH from Vulkanologiya I Seysmologiya (Moscow, USSR), no. 3, May - Jun. 1985 p 54-63 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

A surface IR survey method was developed for obtaining quantitative data on the heat regime of thermal fields associated with volcanic and hydrothermal activity. The method provides data on the spatial characteristics of geothermal activity within volcanic structures and hydrothermal systems, including places where contact measurements cannot be made. The IR survey was made on Mutnovskiy volcano, where the intensity of fumarole activity was evaluated by contact measurements. At its peak there is an extensive depression formed by two merging craters with diameters of about 1.5 to 2 km and with fumaroles. The heat fields on the inner walls of the funnel are inaccessible for contact measurements; wall steepness dictates use of a surface survey. Observations were made from a distance of 7 m, which provided the first quantitative data for estimating total heat intensity of fumarole activity for Mutnovskiy volcano. It is found that the total intensity is appreciably lower than was assumed earlier. E.A.K.

N86-20918# Joint Publications Research Service, Arlington, Va.
NEOTECTONICS AND VOLCANISM IN EASTERN VOLCANIC ZONE OF KAMCHATKA Abstract Only **c46**
I. V. Florenskiy and V. G. Trifonov *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 42 Transl. into ENGLISH from Geotektonika (Moscow, USSR), no. 4, Jul. - Aug. 1985 p 78-87 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

The relationship between Quaternary volcanoes and different elements of the present-day structure of Kamchatka was studied. On Kamachatka there are three main zones of concentration of Quaternary volcanism: middle range, central Kamchatkan depression, eastern volcanic zone. The volcanic Quaternary zones are associated with regions of downwarping with a predominant synchronous regime of transverse dilatation. The dilatation zone ensures a general rising of magma from the deep horizons where the main magma hearths are situated and the volcanotectonics reflects the life of peripheral magma hearths situated in the higher crustal horizons. The rejuvenation of the faults forming the zone and the caldera depressions from south to north is evidence of propagation of the zone in this direction. There is a geodynamic disharmony between mantle and crustal structural stages. The position of deep and peripheral magma hearths within a single volcanic zone may be related to the structural-dynamic stratification of the lithosphere. The structural-dynamic conditions beneath the volcanic zone are considerably more complex than would be surmised from simple subduction of an oceanic plate beneath an island arc. E.A.K.

N86-20919# Joint Publications Research Service, Arlington, Va.
REGULARITY OF STRUCTURE OF INHOMOGENEITIES OF SCATTERING OF OPTICAL RADIATION AND THEIR RELATIONSHIP TO METEOROLOGICAL PARAMETERS Abstract Only **c74**
Yu. A. Polkanov *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 44 Transl. into ENGLISH from Izvestiya Akademii Nauk SSSR: Fizika Atmosfery I Okeana (Moscow, USSR), v. 21, no. 7, Jul. 1985 p 720-725 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

Stable atmospheric stratification favors the suppression of turbulence in a flow, but it is maintained in a zone of collapse of internal waves, where a quite stable and regular turbulent structure is formed. Radiation scattered on such aerosol carries information on the spatial-temporal characteristics of turbulent structures. The regularity of structure of a scattered signal amplified proportionally to the square of current time squared is analyzed. At nightime a quite stable and regular structure of optical inhomogeneities in the horizontal plane was established. Its registry in lidar measurements was caused by the presence of urban polluting aerosol. There was a high degree of correlation between the parameters of the detected structure and stability of the thermodynamic state of the atmospheric surface layer test. A signifcant correlation between a set of parameters describing these atmospheric formations and a set of meteorological parameters characterizing atmospheric humidity and inversion situations. The investigation shows that laser sounding can be used in predicting stability of stratification in the atmospheric surface layer. E.A.K.

N86-20920# Joint Publications Research Service, Arlington, Va.
SOUND RADIATION IN ATMOSPHERE DURING UNDERWATER EARTHQUAKE Abstract Only **c46**
S. P. Vdovichenko and Yu. M. Zaslavskiy *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 45 Transl. into ENGLISH from Izvestiya Akademii Nauk SSSR: Fizika Atmosfery I Okeana (Moscow, USSR), v. 21, no. 7, Jul. 1985 p 714-719 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

Acoustic fields in the atmosphere generated by hydroacoustic disturbances which are caused by seismic movements of bottom rocks during an underwater earthquake are used to predict tsunami waves. Different models of deepened seismic sources equivalent to an earthquake focus with respect to the total quantity of released energy are outlined. The characteristics of radiation introduced by the ocean water layer are examined. The dependence of the level and directional diagram of radiation of focal depth is examined. The level of acoustic oscillations is examined at the maximum of

the diagram at altitudes were the appearance of ionized regions detectable during sounding by Doppler radars is possible. Author

N86-20921# Joint Publications Research Service, Arlington, Va.
CALCULATION OF SOUND FIELDS IN ATMOSPHERIC REFRACTION WAVEGUIDE Abstract Only **c71**
A. V. Razin *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 45-46 Transl. into ENGLISH from Izvestiya Akademii Nauk SSSR: Fizika Atmosfery I Okeana (Moscow, USSR), v. 21, no. 7, Jul. 1985 p 707-713 Previously announced in IAA as A85-46238 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

The sound intensity of a point harmonic source in a near-ground atmospheric refraction waveguide has been estimated using a geometrical acoustics approximation. The waveguide was created by the interaction of air temperature inhomogeneities with the wind. Questions concerning the definition of waveguide parameters are discussed, and criteria are developed to estimate the number of rays approaching the point source. The effect of temperature gradients and wind on the sound intensity of an acoustic radar in the near-ground atmospheric layer was calculated numerically, and results are presented. I.H. (IAA)

N86-20922# Joint Publications Research Service, Arlington, Va.
ACOUSTIC WAVE PROPAGATION IN POLYMERIC FLUID WITH VAPOR-GAS BUBBLES Abstract Only **c71**
S. P. Levitskiy and Z. P. Shulman *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 46 Transl. into ENGLISH from Akusticheskiy Zhurnal (Moscow, USSR), v. 31, no. 3, May - Jun. 1985 p 353-357 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

Acoustic properties of polymeric fluids with bubbles were studied. The multiple scattering method was used to investigate sound propagation in a relaxing fluid with vapor-gas inclusions. The approach makes successive allowance for all the principal factors determining the process: compressibility and heat conductivity of the fluid during interaction of inclusions with the carrier phase and with one another, polydisperse character of the mixture, presence of vapor in the bubbles and distribution of fluid relaxation time. The propagation of a monochromatic wave of weak nonisothermal disturbances in a relaxing polymeric medium with rheological equations of the hereditary type is determined. The characteristic parameters were equilibrium radius of one of the bubbles, fluid density, pressure and temperature. A dispersion equation for a two-phase hereditary medium is derived and analyzed. Application of the equation is illustrated in a specific example. E.A.K.

N86-20923# Joint Publications Research Service, Arlington, Va.
INTERNAL GRAVITY WAVES, FLUCTUATIONS OF SOLAR ULTRAVIOLET RADIATION AND IONOSPHERIC PARAMETERS Abstract Only **c46**
R. S. Steblova, I. A. Freyzon, V. V. Koltsov, Ye. I. Chertok, Yu. V. Gorokhov, V. A. Vazherkin, I. N. Panova, and M. G. Kogan *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 47 Transl. into ENGLISH from Doklady Akademii Nauk SSSR (Moscow, USSR), v. 283, no. 2, Jul. 1985 p 353-357 Previously announced in IAA as A85-46032 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

Experimental data are presented which indicate similar and synchronous fluctuations in the ionospheric electron concentration maximum and in the intensity of the near-field UV radiation recorded at ground stations located far from one another. This phenomenon cannot be explained in the context of the internal gravity wave theory. The working hypothesis proposed here is that solar radiation fluctuations are capable of producing wave perturbations in the ionosphere. The causes and mechanisms of the observed synchronicity, however, remain unclear. V.L. (IAA)

N86-20924# Joint Publications Research Service, Arlington, Va.
DIALOG SYSTEM FOR NUMERICAL MODELING OF ENERGY LOSSES OF ATMOSPHERIC OPTICAL WAVES Abstract Only **c74**
V. Ye. Zuyev, Yu. S. Makushkin, A. A. Mitsel, L. I. Nesmelova, O. B. Rodimova, V. P. Rudenko, S. D. Tvorogov, K. M. Firsov, and N. Ye. Yakovlev *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 47-48 Transl. into ENGLISH from Doklady Akademii Nauk SSSR (Moscow, USSR), v. 283, no. 2, Jul. 1985 p 345-348 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

A dialog system ensuring automated numerical modeling of absorption of the energy of optical waves by atmospheric gas components for any spectral resolution is described. The system consists of a set of programs which in a dialog regime with BESM-6 computer makes it possible to carry out computations of the characteristics of absorption by atmospheric gases and the attenuation caused by atmospheric aerosols and molecular scattering and therefore computations of total atmospheric attenuation. The development of this dialog regime required the following: (1) preparation of a working data bank; (2) writing of algorithms for retrieval and sampling of absorption lines informative for stipulated conditions; (3) writing of algorithms for speedy calculation of absorption characteristics. The working data bank includes the parameters of absorption lines of atmospheric gases, meteorological models, continuum absorption constants, aerosol models. The system provides for three operating regimes. The system has a number of advantages in comparison with known sets of programs for solving such problems. Author

N86-20925# Joint Publications Research Service, Arlington, Va.
ONE METHOD FOR COMPENSATING DISTORTIONS CAUSED BY ATMOSPHERIC TURBULENCE Abstract Only **c74**
V. N. Filinov and G. P. Chernyy *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 48 Transl. into ENGLISH from Optika I Spektroskopiya (Leningrad, USSR), v. 58, no. 3, Mar. 1985 p 634-639 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

The resolution of an aberration-free optical system which is dependent on diffraction phenomena in the aperture and atmospheric turbulence is discussed. A holographic method which uses compensation of the distortions caused by turbulence of an equality of the mean value of the phase fluctuations caused by the atmosphere to zero was developed. The difficulty in applying this method is the problem of determining distribution of the field phase at the input aperture of the system. This distribution can be obtained from interference experiments due to the high frequency of the light wave. The influence of the finite dimensions of the investigated object on the attainable angular resolution in the retrieved image was examined. The extent of the isoplanatism zone is determined. The results of computer modeling of the method and the results of experiments for evaluating the extent of the isoplanatism zone are presented. The materials demonstrate the feasibility of compensating the phase distortions introduced by atmospheric turbulence by averaging the field phase in the aperture plane of the optical system after determining the phase distribution from interference measurements. E.A.K.

N86-20926# Joint Publications Research Service, Arlington, Va.
TESTING OF WIND POWER UNITS AT ANTARCTIC STATION **c44**
G. Sergeyev *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 50 Transl. into ENGLISH from Vodnyy Transport (Moscow, USSR), 15 Oct. 1985 p 4 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

Multipurpose wind-driven power generating units were tested. Each one generates 4 to 6 kilowatts. The windmills heat buildings by converting the energy of wind into electric power. A unit is located on an ice dome near the outlying airfield. It sometimes replaces a diesel generator and provides enough electric power for heat, light, cooking, and charging storage batteries. The use of wind motors on the Antarctic continent will make it possible to

save diesel fuel and to support various operations. Year round aerometeorological, geophysical, glaciological, and biological effects are studied. Author

N86-20927# Joint Publications Research Service, Arlington, Va.
POLLUTION OF ARCTIC SEAS BY RADIOACTIVE WASTES OF WEST EUROPEAN ATOMIC INDUSTRY PLANTS Abstract Only **c45**
S. M. Vakulovskiy, A. I. Nikitin, and V. B. Chumichev *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 52 Transl. into ENGLISH from Atomnaya Energiya (Moscow, USSR), v. 58, no. 6, Jun. 1985 p 445-449 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

The waters of the Barnets, Kara and Greenland Seas were studied to determine the parameters of transport and determination of the limits of propagation of radioactive pollutants caused by the atomic industry. It was shown that radiation conditions in the western Arctic seas are influenced by the receipt of waters of the Norwegian coastal current, which is polluted by radioactive wastes. The presence of a radioactive indicator in a measurable quantity can be used in solving problems related to the dynamics of waters and identification of water masses in the Arctic Basin. The tabulated data for the Greenland, Barnets and Kara Seas suggest that the radioactive pollution observed there is also propagated to other parts of the Arctic Ocean. E.A.K.

N86-20928# Joint Publications Research Service, Arlington, Va.
POSTULATED METEORITIC STRUCTURES IN ROSS SEA (ANTARCTICA) Abstract Only **c90**
L. P. Khryanina *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 53 Transl. into ENGLISH from Izvestiya Akademii Nauk SSSR: Seriya Geologicheskaya (Moscow, USSR), no. 8, Aug. 1985 p 128-132 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

Morphological and mineralogical information indicates that there are two structures on the Ross Sea shelf which may be of a meteoritic origin. The crater has a diameter of about 100 km and the wall rises as much as 800 m above the bottom. The Bauers annular structure corresponds to a concentric system of gravity anomalies with positive delta g values for horsts and netative values for grabens, as is typical for meteoritic structures. The clear expression of the crater in the relief, the fact that it is superposed on the present-day continental slope and is filling with thick strata of recent sediments are indicative of its youth. A meteorite explosion logically explains a number of contradictory facts concerning the geological history of the Ross Sea, especially the 300 km northward jump of the boundary of iceberg drift and cold-loving fauna in the ocean and the simultaneous interglacial and lush development of fauna in the Ross Sea 5 to 3 million years ago. After formation of the crater the waters of the Ross Sea for some time became warmer and the surrounding ocean became colder due to the thawing of ice transported from the Ross Sea ice shelf. Author

N86-20929# Joint Publications Research Service, Arlington, Va.
ERROR IN METHOD FOR FLIGHT TESTS OF RADAR INSTRUMENTS FOR MEASURING ICE THICKNESS Abstract Only **c35**
V. V. Bogorodskiy and A. G. Oganesyan *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 53-54 Transl. into ENGLISH from Zhurnal Tekhnicheskoy Fiziki (Leningrad, USSR), v. 55, no. 6, Jun. 1985 p 1159-1162 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

Various radar instruments for measuring ice thickness (ITR) were introduced, but it is essential to have reliable means for precise determination of their meteorological parameters. The error in measurement instruments are determined in field tests by a comparison of the results of measurements made with the tested and reference (standard) instruments. A method making it possible to use asynchronous series (2) with i =/= j was developed, using as a point of departure an ideal ITR which forms a series d sub i fully coinciding with the reference series d sub i0. This serves as a basis for a method which can be used aboard an aircraft or a hovering helicopter. Another method is based on the strong correlation of closely spaced ice thickness readings. This quasisynchronous method makes it possible to obtain the ITR rms error without a sample d sub i0 series although this applies only to the standard deviation. In order to find the systematic error it is still necessary to measure ice thickness along the line, but asynchronous measurements are adequate for this purpose. The quasisynchronous method is particularly effective when two or more identical ITR are carried aboard an aircraft and only one transmitter is used in shaping the sounding signal. This method is the most suitable for ITR flight tests. E.A.K.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N86-20930 New South Wales Univ., Kensington (Australia).
THE IMPLEMENTATION OF A LAND USE SUITABILITY STUDY ON A COMPUTER-ASSISTED MAPPING SYSTEM Abstract Only
Pau Wai Kwong Yeung Mar. 1985 2 p
Avail: Issuing Activity

The implementation of an experimental Land Use Suitability Study System using the Intergraph (CAD/CAM) System is described. The traditional techniques for a Land Use Suitability Study (LUSS) are reviewed. The objectives and applications are considered as part of the system analysis of a computer-assisted LUSS System. The Landplan System, a computer-assisted system for LUSS utilizing grid cell structure, and the methodology adopted by the METLAND Project are discussed. The capability of the Intergraph System in relation to the implementation of the project using vector structure is discussed. Intergraph System is described in terms of its basic system features and development philosophy. The graphical system and the attribute database are the basic structures of the System. The problems and solutions in relation to the implementation are listed and discussed with reference to the adoptation of the Intergraph System as a LUSS System.
E.A.K.

N86-20931* National Aeronautics and Space Administration, Washington, D.C.
EARTH RESOURCES: A CONTINUING BIBLIOGRAPHY WITH INDEXES
Jan. 1986 100 p
(NASA-SP-7041(48); NAS 1.21:7041(48)) Avail: NTIS HC A05 CSCL 05B

This bibliography lists 326 reports, articles and other documents introduced into the NASA Scientific and Technical Information System between October 1 and December 31, 1985. Emphasis is placed on the use of remote sensing and geophysical instrumentation in spacecraft and aircraft to survey and inventory natural resources and urban areas. Subject matter is grouped according to agriculture and forestry, environmental changes and cultural resources, geodesy and cartography, geology and mineral resources, hydrology and water management, data processing and distribution systems, instrumentation and sensors, and economic analysis. Author

N86-20932*# California Univ., Santa Barbara. Dept. of Geography.
CANOPY REFLECTANCE MODELING IN A TROPICAL WOODED GRASSLAND Semiannual Report
David Simonett 31 Jan. 1986 5 p
(Grant NAGw-788)
(NASA-CR-176514; NAS 1.26:176514) Avail: NTIS

HC A02/MF A01 CSCL 02F

A study area was selected in West Africa in order to establish a relationship between rainfall and grassland productivity, and also to provide ground measurements and support for the GIMMS investigation of the use of AVHRR vegetation index data for monitoring grassland biomass and productivity. Field data collection, image and collateral data acquisition, model development, and data analysis and processing are briefly discussed. E.R.

N86-20933*# California Univ., Santa Barbara. Dept. of Geography.

ADVANCED DATA STRUCTURES FOR THE INTERPRETATION OF IMAGE AND CARTOGRAPHIC DATA IN GEO-BASED INFORMATION SYSTEMS Final Report

Donna J. Peuquet 4 Mar. 1986 84 p refs

(Grant NAG5-369)

(NASA-CR-176559; NAS 1.26:176559) Avail: NTIS HC A05/MF A01 CSCL 08B

A growing need to usse geographic information systems (GIS) to improve the flexibility and overall performance of very large, heterogeneous data bases was examined. The Vaster structure and the Topological Grid structure were compared to test whether such hybrid structures represent an improvement in performance. The use of artificial intelligence in a geographic/earth sciences data base context is being explored. The architecture of the Knowledge Based GIS (KBGIS) has a dual object/spatial data base and a three tier hierarchial search subsystem. Quadtree Spatial Spectra (QTSS) are derived, based on the quadtree data structure, to generate and represent spatial distribution information for large volumes of spatial data. B.G.

N86-20934*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

SIMULATION OF LANDSAT MULTISPECTRAL SCANNER SPATIAL RESOLUTION WITH AIRBORNE SCANNER DATA

Christine A. Hlavka Jan. 1986 10 p refs

(NASA-TM-86832; A-85400; NAS 1.15:86832) Avail: NTIS HC A02/MF A01 CSCL 08B

A technique for simulation of low spatial resolution satellite imagery by using high resolution scanner data is described. The scanner data is convolved with the approximate point spread function of the low resolution data and then resampled to emulate low resolution imagery. The technique was successfully applied to Daedalus airborne scanner data to simulate a portion of a LANDSAT multispectra scanner scene. Author

N86-20935*# Southern Methodist Univ., Dallas, Tex. Dept. of Geological Sciences.

ANALYSIS AND INTERPRETATION OF MAGSAT ANOMALIES OVER NORTH AFRICA Final Technical Report, 1 Mar. 1983 - 31 May 1985

Roger J. Phillips 1985 104 p refs

(Grant NAG5-298)

(NASA-CR-176607; NAS 1.26:176607) Avail: NTIS HC A06/MF A01 CSCL 08G

Crustal anomaly detection with MAGSAT data is frustrated by inherent resolving power of the data and by contamination from external and core fields. Quality of the data might be tested by modeling specific tectonic features which produce anomalies that fall within proposed resolution and crustal amplitude capabilities of MAGSAT fields. To test this hypothesis, north African hotspots associated with Ahaggar, Tibesti and Darfur were modeled as magnetic induction anomalies. MAGSAT data were reduced by subtracting external and core fields to isolate scalar and vertical component crustal signals. Of the three volcanic areas, only the Ahaggar region had an associated anomaly of magnitude above error limits of the data. Hotspot hypothesis was tested for Ahaggar by seeing if predicted magnetic signal matched MAGSAT anomaly. Predicted model magnetic signal arising from surface topography of the uplift and the Curie isothermal surface was calculated at MAGSAT altitudes by Fourier transform technique modified to allow for variable magnetization. Curie isotherm surface was calculated using a method for temperature distribution in a moving plate above a fixed hotspot. Magnetic signal was calculated for a fixed plate as well as a number of plate velocities and directions. Author

N86-20936# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

THE BRAZILIAN REPORT TO THE 7TH LANDSAT TECHNICAL WORKING GROUP (LTWG) MEETING

Jose Luiz deBarros Aquirre, Leopoldo Edgardo Messenger Parada, and Sergio dePaula Pereira Oct. 1985 10 p Presented at the 7th LTWG Meeting, Williamsburg, Va., 26 Feb. - 1 Mar. 1985 Sponsored by NASA

(NASA-CR-176592; NAS 1.26:176592; INPE-3672-PRE/826) Avail: NTIS HC A02/MF A01 CSCL 05B

Described is the current status of the INPE LANDSAT receiving and processing facilities, as well as the experience in the related activities during the period from June 1984 to February 1985. Author

N86-20937*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

BRAZIL'S REMOTE SENSING ACTIVITIES IN THE EIGHTIES

Marco Antonio Raupp, Roberto PereiradaCunha, and Rene Antonio Novaes Oct. 1985 7 p Presented at the 5th Selper Meeting, Ottawa, Ontario, 15-19 Jul. 1985

(NASA-CR-176591; NAS 1.26:176591; INPE-3671-PRE/825) Avail: NTIS HC A02/MF A01 CSCL 05B

Most of the remote sensing activities in Brazil have been conducted by the Institute for Space Research (INPE). This report describes briefly INPE's activities in remote sensing in the last years. INPE has been engaged in research (e.g., radiance studies), development (e.g., CCD-scanners, image processing devices) and applications (e.g., crop survey, land use, mineral resources, etc.) of remote sensing. INPE is also responsible for the operation (data reception and processing) of the LANDSATs and meteorological satellites. Data acquisition activities include the development of CCD-Camera to be deployed on board the space shuttle and the construction of a remote sensing satellite. Author

N86-20938# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

EFFICIENCY/EQUITY ANALYSIS OF WATER RESOURCES PROBLEMS: A GAME THEORETIC APPROACH Ph.D. Thesis

E. K. Ng 1985 175 p

(AD-A160685; AFIT/CI/NR-85-113D) Avail: NTIS HC A08/MF A01 CSCL 05/1

Successful regional water resources planning involves an efficiency analysis to find the optimal system that maximizes benefits minus costs, and an equity analysis to apportion project costs. Traditionally, these two problems have been treated separately. A reliable total numerization procedure is used to find the optimal system for regional water network problems. This procedure is easy to understand and can be implemented using readily available computer software. Furthermore, the more engineer can use realistic cost functions or perform detailed cost analysis and, also, examine good suboptimal systems. In addition, this procedure finds the optimal system for each individual and each subgroup of individuals; hence, an equity analysis can be accomplished using the theory of the core from cooperative n-person game theory on the optimal system as well as good suboptimal systems. A rigorous procedure using core conditions and linear programming is described to unambiguously measure an individual's minimum cost and maximum cost as a basis for the equitable cost allocation. Traditional approaches for quantifying minimum cost and maximum cost assume that either a regional system involving the grand coalition is built or all the individuals will go-it-alone. GRA

N86-20939# Colorado State Univ., Fort Collins. Dept. of Earth Resources.

MICROWAVE DETERMINATION OF SNOWPACK LIQUID WATER CONTENT Final Report, 19 Sep. 1983 - 18 May 1985

H. S. Boyne 15 Sep. 1985 43 p

(Contract DAAG29-83-K-0161)

(AD-A161798; ARO-20107.1-GS) Avail: NTIS HC A03/MF A01 CSCL 08/12

The measurement of liquid water in snowpack based on the electrical path length difference in snowpack depth in the region of high dielectric dispersion of water is described. The measurement system consists of a previously described LFM/CW microwave system (Ellerbruck and Boyne, 1980) operating at two frequency bands 2 to 5 GHz and 5 to 8 GHz. The system is tested, evaluated and intercompared with a dilution measurement technique (Davis, et al., 1985) in both a laboratory and field environment. It is found that the two methods of intercomparison are equivalent provided the snowpack is homogeneous and free of stratigraphy. The accuracy of the intercomparison is + or - 2.5% at the 95% level of confidence. The intercomparison of the methods is not equivalent when compared in an inhomegeneous stratified snowpack. The microwave system consistently registers a higher volumetric liquid water content than the dilution method. This discrepancy is believed due to differences in the snowpack volumes sampled. In particular, it is believed that ponded water above impermeable layers regions in the snowpack is responsible for the discrepancy. These regions could not be cored successfully for measurement by the dilution method. Author (GRA)

N86-20940# Geological Survey, Lincoln, Nebr.
HYDROGEOLOGY OF PARTS OF THE CENTRAL PLATTE AND LOWER LOUP NATURAL RESOURCES DISTRICTS, NEBRASKA
J. M. Peckenpaugh and J. T. Dugan 1985 142 p refs
(TI85-901799; USGS/WRI-83-4219) Avail: NTIS HC A07/MF A01

Water-level declines of at least 15 feet have occurred in this heavily irrigated area of central Nebraska since the early 1930's, and potential for additional declines is high. To test the effects of additional irrigation development on water levels and streamflow in the area, computer programs were veloped that represent the surface-water system, soil zone, and saturated zone of the hydrogeologic system. A two-dimensional, finite-difference ground-water flow model of the 3,374 square-mile study area was developed and calibrated using steady-state and transient conditions, and three management alternatives were examined. Results indicate that significant additional water-level declines will occur even if there is no additional ground-water development. The first management alternative examined is diversion of an additional 125,000 acre-feet of water per year from the Platte River. This alternative would have a substantial effect on flows in the Platte River. The second alternative examined is to allow no new ground-water development after 1980, but to apply irrigation water at five different rates ranging from a low of 80 percent of consumptive irrigation requirements (CIR) to a high of 16.0 inches per year (about 125 to 150 percent of CIR) for the western part of the study area. The third alternative is to allow potentially irrigable but unirrigated land to be developed at an annual rate of 2, 5, and 8 percent and to apply irrigation water at 80, 100, and 120 percent of CIR. R.J.F.

N86-20941# Rogers, Golden and Halpern, Inc., Reston, Va.
GULF OF MEXICO: OUTER CONTINENTAL SHELF OIL AND GAS ACTIVITIES IN THE GULF OF MEXICO AND THEIR ONSHORE IMPACTS
Christopher W. Lynch and Robert W. Rudolph Sep. 1984 141 p
(Contract DI-14-12-0001-30042)
(TI85-901421; OCS/MMS-84-0073) Avail: NTIS HC A07/MF A01

Issues and developments occuring in the Gulf of Mexico Outer Continental Shelf region are discussed. The geology and geologic history of deepwater zones are detailed. The results of areawide leasing in the Gulf is described. The transportation of hydrocarbon and changes that will come as development moves to frontier areas are also discussed. The effects of the two year recession, increased exploratory rig activity, and the use of advanced technology in refining operations are examined. E.R.

N86-20942# Geological Survey, Reston, Va.
GROUND-WATER REGIONS OF THE UNITED STATES
Ralph C. Heath 1984 85 p
(TI85-902209; USGS-WSP-2242; LC-83-600247) Avail: NTIS HC A05/MF A01

Ground water occurs in the rocks that form the Earth's crust and thus is in the domain of geology. Because the geology of the country is complex, the occurrence of ground water, in details, is extremely complex. This complexity makes it difficult for many people to develop an understanding of ground-water occurrence and availability and has resulted in problems of ground water depletion and ground-water pollution whose correction will be both difficult and expensive. Fortunately, such problems are not yet widespread and can, with intelligent applications of existing ground-water knowledge, be avoided in most other areas. However, to realize the goal, those engaged in water resources development and management and the general public need to become better informed on the Nation's ground-water resources. Those water resources are described. A discussion of the general aspects of geology and rocks as is a description of the ground water systems in the 15 ground-water regions into which the United States, Puerto Rico, and the Virgin Islands are divided is given. DOE

N86-20943# Los Alamos National Lab., N. Mex.
COLLECTION AND ANALYSIS OF GEOTHERMAL GASES
L. Shevenell, F. Goff, L. Gritzo, and P. E. Trujillo, Jr. Jul. 1985 26 p refs
(Contract W-7405-eng-36)
(DE86-001234; LA-10482-OBES) Avail: NTIS HC A03/MF A01

Rapid, reliable procedures are described for the collection and analysis of geothermal gases at Los Alamos National Laboratory. Gases covered are H2, He, Ar, O2, N2, CH4, C2H6, CO2, and H2S. The methods outlined are suitable for geothermal exploration. DOE

N86-20944# Massachusetts Inst. of Tech., Cambridge. Dept. of Earth, Atmospheric and Planetary Sciences.
URANIUM IN CLAYS OF CRYSTALLINE ROCKS
G. Simmons and L. Caruso 10 Mar. 1985 28 p refs
(Contract DE-AC02-78ER-04972)
(DE86-000878; DOE/ER-04972/T2) Avail: NTIS HC A03/MF A01

Uraniferous clay aggregates in several granites have been examined in detail with a scanning electron microscope (SEM) equipped with a high resolution backscattered electron detector (BSE) and an energy dispersive X-ray system (EDS). The same polished sections used for the microscope observations were irradiated with thermal neutrons and the etched lexan detectors were then used to determine the location of uranium with a spatial resolution of a few microns. A set of 100 samples of granites were used for this study. These samples contain clay rich regions as large as a few millimeters that appear to consist entirely of clay when examined with the petrographic microscope. The fission track detectors show uranium to be present within the regions. Close examination with the BSE and EDS, however, shows in every instance that the host for the uranium is not clay but clay-sized grains of several minerals. This finding may have severe implications for the long-term retention of uranium and transuranic elements adsorbed on clay. Perhaps the presence of clay is not significant for the long-term retention of radioisotopes. DOE

N86-20945# North Carolina State Univ., Raleigh. Sea Grant Coll. Program.
LAND USE AND LAND COVER CLASSIFICATION OF THE NORTH CAROLINA BARRIER ISLANDS: LEVEL 3
S. Baker May 1985 107 p refs Prepared in cooperation with East Carolina Univ., Greenville, N.C.
(Grant NA83AA-D-00012)
(PB86-102498; UNC/SG-85-03) Avail: NTIS HC A06/MF A01 CSCL 13B

North Carolina's ocean shoreline consists entirely of a chain of sandy barrier islands. To understand and manage this fragile natural resource, it necessary to evaluate the impact of people

on the islands. This can be done by classifying, mapping and measuring the different ways the land is being used. A detailed survey of land use and land cover can give us an appreciation of the existing situation. This type of information is needed to plan future growth. It will help preserve the beauty of the islands and their ecologically valuable areas. GRA

N86-20946# Joint Publications Research Service, Arlington, Va.
EAST EUROPE REPORT
17 Jan. 1986 179 p refs Transl. into ENGLISH from various East European articles
(JPRS-EER-86-007) Avail: NTIS HC A09/MF A01

Research in agriculture, economics, microelectronic and remote sensing is discussed. Astronomy, quality control, refining, air pollution, and construction material are also discussed. For individual titles, see N86-20947 through N86-20948.

N86-20947# Joint Publications Research Service, Arlington, Va.
RESEARCH CONTRIBUTIONS IN ASTRONOMY, SATELLITE REMOTE SENSING
In its East Europe Report (JPRS-EER-86-007) 17 Jan. 1986 p. 152-154 Transl. into ENGLISH from Astronautyka (Warsaw, Poland), No. 4, Apr. 1985 p 2 (For primary document see N86-20946 11-43)
Avail: NTIS HC A09/MF A01

Various research programs in astronomy and remote sensing are briefly discussed. A space probe to study Halley's Comet, interstellar gas investigations, magnetic star studies, a spaceborne telescope and spaceborne infrared photography are among the topics covered. R.J.F.

N86-20948# Joint Publications Research Service, Arlington, Va.
RESEARCH ON FIRE RESISTANT PLASTIC MOLDING COMPOUNDS **c27**
Wieslaw Nowaczek and Waclaw Krolikowski *In its* East Europe Report (JPRS-EER-86-007) 17 Jan. 1986 p 155-156 Transl. into ENGLISH from Chemik (Gliwice, Poland), no. 8, Aug. 1985 p 199-203 (For primary document see N86-20946 11-43)
Avail: NTIS HC A09/MF A01

Research for fire-resistant plastic molding compounds is discussed. Emphasis is on the development of noncombustible polyester molding plastic compounds of the DMC type using domestically produced aluminum hydroxide subjected to additional laboratory processes of drying and grinding to obtain the required grain size. R.J.F.

N86-20446# Joint Publications Research Service, Arlington, Va.
RADAR OBSERVATIONS OF RIVER OVERFLOWS FROM OUTER SPACE Abstract Only
A. P. Pichugin, A. S. Gavrilenko, A. G. Gribunin, L. V. Yelenskiy, A. I. Kalmykov, and V. P. Shestopalov *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 63 Transl. into ENGLISH from Doklady Akademii Nauk SSSR (Moscow, USSR), v. 284, no. 2, Sep. 1985 p 323-326 Original language translation was announced in IAA as A86-13984 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

N86-20450# Joint Publications Research Service, Arlington, Va.
STUDY OF SPATIAL STRUCTURE OF SOIL COVER IN BAYKAL REGION USING AEROSPACE PHOTOGRAPHS Abstract Only
V. A. Kuzmin *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 67 Transl. into ENGLISH from Issledovaniye Zemli Iz Kosmosa (Moscow, USSR), no. 4, Jul. - Aug. 1985 p 53-57 Original language document was announced in IAA as A86-13282 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

N86-20451# Joint Publications Research Service, Arlington, Va.
RADIATION CORRECTION FOR AEROSPACE IMAGES OF AGRICULTURAL CROPS Abstract Only
A. S. Barykin, V. V. Kozoderov, and V. P. Popov *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 68-69 Transl. into ENGLISH from Issledovaniye Zemli Iz Kosma (Moscow, USSR), no. 4, Jul. - Aug. 1985 p 78-85 Original language document was announced in IAA as A86-13285 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

N86-20454# Joint Publications Research Service, Arlington, Va.
ALLOWANCE FOR PROPERTIES OF BOUND MOISTURE IN REMOTE SENSING OF SOIL MOISTURE CONTENT Abstract Only
T. A. Sologubova and V. S. Etkin *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 71 Transl. into ENGLISH from Issledovaniye Zemli Iz Kosmosa (Moscow, USSR), no. 4, Jul. - Aug. 1985 p 112-115 Original language document was announced in IAA as A86-13289 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

N86-20455# Joint Publications Research Service, Arlington, Va.
THE EXPLORATION OF OUTER SPACE AND THE DEVELOPING COUNTRIES
S. M. Monin *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 72-78 Transl. into ENGLISH from Zemlya I Vselennaya (Moscow, USSR), no. 4, Jul. - Aug. 1985 p 76-81 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N86-20949 Brown Univ., Providence, R. I.
FABRICATION AND CHARACTERIZATION OF QUENCH CAST SILICON FOR SOLAR CELL APPLICATION Ph.D. Thesis
Thomas Cutler Russell 1985 140 p
Avail: Univ. Microfilms Order No. DA8519900

A new silicon ribbon casting process was developed for use in the fabrication of low cost photovoltaic cells. This process is known as double roller quench casting and produces ribbon directly from silicon melt. Solar cells fabricated on quench cast material have efficiencies as high as 8.7% under simulated AM1 spectrum. The minority carrier diffusion length as measured by spectral response was found to be on the order of 10 microns. An open circuit voltage of 484 mV was measured and is consistent with the diffusion length. Solar cells were passivated with hydrogen plasma. The solar cell conversion efficiency was increased by as much as 40%. Electron beam induced current scans revealed that the intragrain response was significantly improved while the grain boundaries showed little improvement. The double roller quench casting process produces good quality ribbon for solar cell application. The conductivity and lifetime of the material appears to be limited by the intragrain defects. Optimization of the casting process may help to reduce the number of defects and further improve the ribbon quality. Dissert. Abstr.

N86-20950# Office of Technology Assessment, Washington, D.C. Congressional Board of the 99th Congress
MARINE APPLICATIONS FOR FUEL CELL TECHNOLOGY: A TECHNICAL MEMORANDUM
Feb. 1986 42 p refs
(OTA-TM-O-37; LC-85-600642) Avail: NTIS HC A03/MF A01

To date, almost no attention was given to the potential marine applications for fuel cell technologies. Some of the benefits that fuel cells may offer to the utility industry may also apply to marine

use. At a 1 day workshop the Office of Technology Assessment found fuel cells to offer advantages in applications requiring quiet operations, applications where throttle settings are constantly changed, and for small submarines. Fuel cells are not expected to penetrate marine markets until they become firmly established in the commercial utility section. B.G.

N86-20951# Maryland Univ., College Park. Dept. of Mechanical Engineering.
LABORATORY EXPERIMENTS ON ABSORPTION HEAT PUMPS
Reinhard Radermacher 1984 6 p refs
(DE85-004050; CONF-841231-19) Avail: NTIS HC A02/MF A01

A series of laboratory performance tests were conducted on an absorption cycle water chiller and heat pump. The part-load performance was compared to the full-load capacity and coefficient of performance. The causes of performance degradation wih shorter operating times are speculated upon with partial substantiation resulting from tests on the chiller after it had been modified to prevent off cycle fluid migration. Author

N86-20952# Hawaii Univ., Manoa. Natural Energy Inst.
TENTH ANNIVERSARY SPECIAL EDITION Annual Report, 1984
1984 184 p
(NP-5901429; TI85-901429) Avail: NTIS HC A09/MF A01

The development and progress in alternative natural energy sources in Hawaii for the past ten years is detailed. A brief history and research and development project summaries are given. The types of energy described are biomass energy, geothermal energy, ocean energy, solar energy, wind energy and hydrogen or methanol production. Other related educational programs and activities are described. E.R.

N86-20953# Chronar Corp., Princeton, N.J.
PHOTOVOLTAIC DEVICES USING HYDROGENATED AMORPHOUS SILICON PRODUCED BY THE CHEMICAL VAPOR DEPOSITION OF HIGHER ORDER SILANES Final Report, 1 Aug. 1982 - 31 Aug. 1983
A. Delahoy Apr. 1985 39 p
(Contract DE-AC02-83CH-10093)
(DE85-008810; SERI/STR-211-2607) Avail: NTIS HC A03/MF A01

Hydrogenated amorphous silicon (a-Si:H) films were prepared by the static chemical vapor deposition (CVD) of mainly disilane. The photoconductivity of the CVD material increased with decreasing activation energy. The temperature dependence of the photoconductivity only exhibits a single high temperature peak. The spectral response of the photoconductivity shifts to longer wavelengths as the temperature increases. An exponential subband gap absorption edge is observed. The ratio of the change in band gap to the change in inverse slope of the absorption edge was found to be the same regardless of whether the deposition temperature or measurement temperature was varied, strongly suggesting that the energy band gap is determined by the disorder. A-Si:H film produced by the mercury sensitized photo CVD of dilane, is expected to be a very promising technique since low deposition temperatures are possible and since atomic hydrogen is produced. B.G.

N86-20954# Alaska Univ., Fairbanks. Geophysical Inst.
GEOTHERMAL ENERGY RESOURCE INVESTIGATIONS IN THE EASTERN COPPER RIVER BASIN, ALASKA
E. M. Wescott and D. L. Turner Jun. 1985 225 p
(Contract DE-FG07-84ID-12471)
(DE86-001803; DOE/ID-12471/T1; UAG-R-302) Avail: NTIS HC A10/MF A01

This report consists of a review of the geological, geochemical and geophysical data available for the Eastern Copper River basin with emphasis on the mud volcanoes, and the results of geophysical and geochemical studies carried out in the summers of 1982 and 1984. The purpose was to determine if there are geothermal energy resources in the Copper River Basin. The Eastern Copper River basin is situated on the flanks of a major volcano, Mt. Drum, which was active as late as 200,000 years ago and which is thought to have retained significant amounts of residual heat at high levels. Mt. Wrangell, farther to the east, has been volcanically active up to the present time. The 1982 geophysical and geochemical surveys located three principal areas of possible geothermal interest, one near Tazlina and two near the Klawasi mud volcanoes. The intensive survey work of 1984 was concentrated on those areas. We have integrated the results of soil helium, soil mercury, gravity, aeromagnetic, electrical, self-potential, and controlled-source audio magnetotelluric (CSAMT) surveys to evaluate the geothermal potential of the areas studied. DOE

N86-20955# Electric Power Research Inst., Palo Alto, Calif.
DOE/EPRI BETA (SODIUM-SULFUR) BATTERY WORKSHOP V: PROCEEDINGS
J. L. Sudsworth, ed. Dec. 1984 750 p Presented at the DOE/EPRI Beta Battery Workshop, Washington, D.C., 18 Oct. 1983 Prepared in cooperation with Beta R and D Ltd., Sinfin, Derby, England; DOE, Washington, D.C.
(DE85-006947; EPRI-EM-3631-SR; CONF-8310241) Avail: NTIS HC A99/MF A01

Separate abstracts were prepared for 48 papers in this conference proceedings. Two other papers had been previously indexed for EDB. DOE

N86-20956# Department of Energy, Morgantown, W. Va.
FUEL CELLS Technology Status Report
Dec. 1984 55 p
(DE85-008591; DOE/METC-85-0223) Avail: NTIS HC A04/MF A01

The US Department of Energy (DOE), Office of Fossil Energy, has supported and managed a fuel cell research and development (R and D) program since 1976. Responsibility for implementing DOE's fuel cell program, which includes activities related to both fuel cells and fuel cell systems, has been assigned to the Morgantown Energy Technology Center (METC) in Morgantown, West Virginia. The total United States effort of the private and public sectors in developing fuel cell technology is referred to as the National Fuel Cell Program (NFCP). The goal of the NFCP is to develop fuel cell power plants for base-load and dispersed electric utility systems, industrial cogeneration, and on-site applications. To achieve this goal, the fuel cell developers, electric and gas utilities, research institutes, and Government agencies are working together. Four organized groups are coordinating the diversified activities of the NFCP. The status of the overall program is reviewed in detail. DOE

N86-20957# Midwest Research Inst., Golden, Colo.
PHOTOVOLTAIC STAND-ALONE APPLICATIONS READING LIST
Aug. 1985 6 p
(Contract DE-AC02-83CH-10093)
(DE85-008811; SERI/SP-271-2728) Avail: NTIS HC A02/MF A01

This list of general publications on photovoltaic stand-alone applications was prepared by the Technical Information Branch at the Solar Energy Research Institute (SERI) for the US Department of Energy (DOE) as part of the Solar Technical Information Program. The list provides an introduction to this literature and is not intended to be comprehensive. Although some of the citations refer to grid-connected photovoltaic systems, they contain basic information applicable to stand-alone applications. Many of the technical reports in this reading list result from government contracts with the Jet Propulsion Laboratory, Sandia National Laboratories-Albuquerque, and the Solar Energy Research Institute, or subcontracts from these laboratories to universities and researchers in private industry. DOE

N86-20958# Pennsylvania Univ., Philadelphia. School of Electrical Engineering.
RESEARCH ON BASIC UNDERSTANDING OF HIGH EFFICIENCY IN SILICON SOLAR CELLS Final Report

M. Wolf Aug. 1985 138 p
(Contract DE-AC02-83CH-10093)
(DE85-016858; SERI/STR-211-2756) Avail: NTIS HC A07/MF A01

Through modeling of silicon solar cell performance, a solar cell design has evolved that could reach efficiencies above 20% (AM1) under standard conditions. Modeling has been based on current understanding of the effects involved in charge carrier generation, transport, and recombination, and on technology-influenced parameters already reported as achieved. It is also important to experimentally determine the values for all parameters used in modeling the device. However, experimental methods for determining physical parameters, particularly minority carrier lifetimes and surface recombination velocities, are still inadequate. A goal of solar cell research has therefore been to develop adequate analytical methods to determine all parameters of a device that affect its performance. This project has contributed to that goal by investigating a closed loop design capability. Based on previous modeling, which resulted in a device design, a developmental fabrication process sequence was also designed. Next, devices were fabricated using the process design. DOE

N86-20959# Sandia National Labs., Albuquerque, N. Mex.
MAGMA ENERGY AND GEOTHERMAL PERMEABILITY ENHANCEMENT PROGRAMS
J. C. Dunn 1985 7 p Presented at the Geothermal Program Review, Washington, D.C., 11 Sep. 1985
(Contract DE-AC04-76DP-00789)
(DE85-018271; SAND-85-2030C; CONF-8509142-6) Avail: NTIS HC A02/MF A01

Accomplishments during FY85 and project plans for FY86 are described for the Magma Energy Extraction and Permeability Enhancement programs. DOE

N86-20960# Midwest Research Inst., Kansas City, Mo.
SOLERAS: SOLAR ENERGY WATER DESALINATION PROJECT. EXXON RESEARCH AND ENGINEERING. VOLUME 3: APPENDICES PILOT PLAN AND DESIGN DETAILS AND SUBSYSTEM DIRECT COST SUPPORT Final Report
1985 409 p
(Contract DE-AC02-83CH-10093)
(DE86-000428; MRI/SOL-0401-03) Avail: NTIS HC A18/MF A01

Details of the design of a water desalination solar pilot plant in Yanbu, Saudi Arabia are presented. The major subsystems of the plant are defined, including solar energy collection and simulation, energy storage, energy delivery, reverse osmosis/multiple effect distillation, water storage, waste disposal, backup power generators, controls and instrumentation data acquisition, facilities and enclosures, and computers. A list of the plant equipment and a set of process flow diagrams are provided. A cost analysis of the pilot plant is included. DOE

N86-20961# Taylor (Robert M.), Boston, Mass.
INTEGRATED AGRICULTURAL ENERGY SYSTEM
R. M. Taylor 1985 3 p
(Contract DE-FG41-81R1-23281)
(DE86-000508; DOE/R1-23281/T1; MA-81-002) Avail: NTIS HC A02/MF A01

The purpose of this program is to show New England farmers and other New England energy users how they can use alternative energy sources to reduce their energy cost and dependency on conventional sources. The project demonstrates alternative energy technologies in solar, alcohol and methane. Dissemination is planned through tours to be conducted by the Worcester County Extension Service. Most of these goals were completed as planned. A few things have yet to be completed. The solar panels and solar hot water tanks have to be installed. The fermenter's agitating and cooling system have to be secured inside the fermenter. Once these items are complete tours will begin early in the spring. DOE

N86-20962# Communications Satellite Corp., Clarksburg, Md.
DESIGN AND DEVELOPMENT OF A SEALED 100-Ah HYDROGEN/NICKEL OXIDE BATTERY Final Report
J. Dunlop, M. Earl, M. Brown, H. Vaidyanathan, W. Gentry, R. Beauchamp, and J. Sindorf Sep. 1985 94 p Prepared in cooperation with Johnson Controls, Inc., Milwaukee, Wis.
(Contract DE-AC04-76DP-00789)
(DE86-001114; SAND-85-7219) Avail: NTIS HC A05/MF A01

Cost studies have shown that the low-cost manufacturing processes developed for mass-produced lead/acid batteries are applicable to the economical production of a limited volume, high-technology/nickel oxide system. Considering that this is a new development in battery technology, performance data are very encouraging, particularly the performance of Battery 2. The technical objectives of the program (20-year life with daily cycling) appear feasible with this new hydrogen/nickel oxide battery system. DOE

N86-20963# Southern Methodist Univ., Dallas, Tex. Dept. of Geological Sciences.
HEAT FLOW AND GEOTHERMAL STUDIES IN THE STATE OF WASHINGTON
D. D. Blackwell, J. L. Steele, and S. A. Kelley Aug. 1985 84 p refs
(Contract DE-AI07-81ID-12307)
(DE86-001550; DOE/ID-12307/1) Avail: NTIS HC A05/MF A01

Existing geothermal gradient and heat flow data for the state of Washington are summarized. In addition, information on mean-annual ground surface temperatures is included. The data consist of accurate, detailed temperature-depth measurements in selected available holes throughout the state of Washington made between 1979 and 1982. Measurements of thermal conductivity on selected rock samples from these drill holes and ancillary information required to assess the significance of the data and calculate heat flow values were obtained as well. Information is presented on the mean-annual ground-surface temperatures throughout the state of Washington. DOE

N86-20964# Pacific Northwest Lab., Richland, Wash.
COMPUTER CODE FOR ANALYZING THE PERFORMANCE OF AQUIFER THERMAL ENERGY STORAGE SYSTEMS
L. W. Vail, C. T. Kincaid, and L. D. Kannberg May 1985 6 p Presented at the ENERSTOCK '85 International Conference on Energy Storage for Building Heating and Cooling, Toronto, Ontario, 22 Sep. 1985
(Contract DE-AC06-76RL-01830)
(DE86-001667; PNL-SA-12870; CONF-850905-6) Avail: NTIS HC A02/MF A01

A code called Aquifer Thermal Energy Storage System Simulator (ATESSS) has been developed to analyze the operational performance of ATES systems. The ATESSS code provides an ability to examine the interrelationships among design specifications, general operational strategies, and unpredictable variations in the demand for energy. The uses of the code can vary the well field layout, heat exchanger size, and pumping/injection schedule. Unpredictable aspects of supply and demand may also be examined through the use of a stochastic model of selected system parameters. While employing a relatively simple model of the aquifer, the ATESSS code plays an important role in the design and operation of ATES facilities by augmenting experience provided by the relatively few field experiments and demonstration projects. ATESSS has been used to characterize the effect of different pumping/injection schedules on a hypothetical ATES system and to estimate the recovery at the St. Paul, Minnesota, field experiment. DOE

N86-20965# Pacific Northwest Lab., Richland, Wash.
AQUIFER THERMAL ENERGY STORAGE IN THE US
L. D. Kannberg Jun. 1985 7 p Presented at the ENERSTOCK '85 International Conference on Energy Storage for Building Heating and Cooling, Toronto, Ontario, 22 Sep. 1985
(Contract DE-AC06-76RL-01830)
(DE86-001668; PNL-SA-13289; CONF-850905-7) Avail: NTIS HC A02/MF A01

DOE has funded investigation of Aquifer Thermal Energy

Storage (ATES) since 1975. The scope of the ATES investigation has encompassed numerical modeling, field testing, economic analyses, and evaluation of institutional issues. ATES has received the bulk of the attention because of its widespread potential in the US. US efforts are now concentrated on a high temperature (up to 150C) ATES field test on the St. Paul campus of the University of Minnesota. Four short-term test cycles and the first of two long-term test cycles have been completed at this site. Utilization of chill ATES to meet summer air conditioning demands has been monitored at two operating sites in Tuscaloosa, Alabama. The systems utilize a cooling tower to directly chill groundwater pumped from a water table aquifer for storage in the same aquifer. The first of the two systems has exhibited relatively poor performance. More comprehensive monitoring has recently been undertaken at another site. DOE

N86-20966# Sandia National Labs., Albuquerque, N. Mex.
AUTONOMOUS PHOTOVOLTAIC-DIESEL POWER SYSTEM DESIGN
T. M. Calloway 1985 13 p Presented at the 18th IEEE Photovoltaic Specialists Conference, Las Vegas, Nev., 21 Oct. 1985
(Contract DE-AC04-76DP-00789)
(DE86-001750; SAND-85-1193C; CONF-851043-5) Avail: NTIS HC A02/MF A01

A methodology for designing an autonomous photovoltaic power system in conjunction with a diesel-fueled electric generator and a battery has been developed. Any photovoltaic array energy not utilized immediately by the load is stored in the battery bank. The diesel generator set is operated periodically at 14-day intervals to ensure its availability and occasionally as needed during winter to supplement combined output from the array and battery. It is hypothesized that logistical support is infrequent, so the hybrid photovoltaic-diesel power system is designed to consume only 10% as much fuel as would a diesel-only system. This constraint is used to generate a set of possible combinations of array area and battery energy storage capacity. For each combination, a battery-life model predicts the time interval between battery replacements by deducting the fraction of total life consumed each day. An economic model then produces life-cycle system cost. Repeating this process for different combinations of array area and battery capacity identifies the minimum-cost system design. DOE

N86-20967# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
SILVER-SILICON BONDING ON SILICA SURFACES
J. R. Pitts Apr. 1985 253 p
(Contract DE-AC02-83CH-10093)
(DE85-012138; SERI/TR-255-2410) Avail: NTIS HC A12/MF A01

The properties of Ag films deposited on silica or silica-based glass substrates have been investigated using X-ray photoelectron spectroscopy (XPS), Auger electron spectroscopy (AES), ion scattering spectrometry (ISS), and secondary ion mass spectrometry (SIMS). Interfacial studies are reported for films prepared by decomposing organometallic Ag on glass, depositing Ag by the wet chemical electroless method onto glass and SiO2, and vacuum evaporating Ag onto SiO2. For organometallic Ag films on glass, depth profiles indicate that the interfacial regions are enriched in Si or depleted in O. For electroless films, Sn-Si bonds are formed after sensitization with tin chloride and Ag-Si bonds are formed after silvering without reducers. Silver is strongly bonded to Si via a set of Sn insertion reactions, but impurities were found at the interfaces and these probably contribute to the rapid degradation of mirrors in terrestrial environments. Particle bombardment of silica with He, Ne, Ar or electrons in the range of 0.25 to 8 keV results in reduction of the surface to form SiO(sub x) (x 2). DOE

N86-20968# Research Triangle Inst., Research Triangle Park, N.C.
AlGaAs-GaAs PATTERNED Ge TUNNEL JUNCTION CASCADE CONCENTRATOR SOLAR CELL Annual Technical Progress Report, 15 Oct. 1983 - 14 Dec. 1984
Aug. 1985 92 p
(Contract DE-AC02-83CH-10093)
(DE85-016856; SERI/STR-211-2755) Avail: NTIS HC A05/MF A01

A two-junction cascade solar cell, 0.5 cm(2) in area, in the AlGaAs-GaAs material system that has a power conversion efficiency of more than 30% at a cell temperature of 50 C is demonstrated. Objectives for the first year of the program included growth of Al sub x Ga sub 1-x As on Al sub y Ga sub 1-y As exposed to air for at least one hour; growth of Ge by vapor phase epitaxy on a GaAs substrate; fabrication of a p/n patterned Ge tunnel junction grown on n-GaAs and demonstration of a current density larger than 80 A/cm(2); growth and characterization of a top cell on a patterned Ge tunnel junction; and fabrication and demonstration of an AlGaAs-GaAs cascade solar cell using the patterned Ge tunnel junction. A patterned Ge-tunnel junction connecting the n-type base region of a GaAs cell to a p(+)-GaAs substrate was demonstrated for the first time. DOE

N86-20969# Oregon State Univ., Corvallis. Wind Resources Assessment Lab.
NORTHEAST NEVADA WIND RESOURCE ASSESSMENT STUDY
R. W. Baker and R. Wittrup Aug. 1985 62 p
(Contract DE-AC79-81BP-29182)
(DE85-018285; DOE/BP-29182/16) Avail: NTIS HC A04/MF A01

Wind power potential at satellite sites around Pequop Summit was poor. Mean annual wind speeds were 8 to 12 mph and mean power density values well below 200 W/m(2). Only the Pequop Summit site had good wind power potential, especially during winter and spring months. In northeast Nevada good winds are only found at well exposed north/south oriented ridges that are at least at 7000 ft (MSL) and above valley temperature inversions. Wind shear in the lowest 200 ft over higher elevation ridgecrest areas is small due to low level acceleration in the winds. At lower elevation sites much higher wind shear was measured. Detailed estimates of wind power potential in Pequop Summit site area revealed windfarms using horizontal axis machines could produce significant levels of energy on a seasonal and annual basis. Annual Capacity Factors varied from 0.28 to 0.30. However, vertical axis turbine used only had an annual Capacity Factor of 0.14 since rated speed was very high. From estimated Pequop Summit land area availability it appears a windfarm could consist of 30 Type A 2500 kW machines, 70 Type B 300 kW units, or 120 Type D 65 kW turbines. Estimated annual energy outputs for windfarms vary from 20,400,000 kWh for Type D units to 184,300,000 kWh for Type A array. DOE

N86-20970# Bohemia Solar and Scientific, Inc., Eugene, Oreg.
THEORY OF THE GEYSER-PUMP SOLAR COLLECTOR Final Report
E. Haines 1985 53 p
(Contract DE-FG06-81R0-01318)
(DE86-000487; DOE/R0-01318/T1; OR-81-004) Avail: NTIS HC A04/MF A01

The geyser-pump solar collector is a self-controlling, self-pumping active collector having no moving or electronic parts, drawing its mechanical pump energy from boiling in the collector's risers. The only use of the geyser-pump principle reported in patents and the open literature is only for circulating the fluid in the collector plate. Computer simulations show that most design and algorithm parameters have only negligible impact on solar fraction, F. The only parameter which affects F is the length of the storage heat exchanger. Episodic cloud cover does not hamper the geyser-pump collector's ability to restart. Daylong simulations show that the energy cost of geyser-pumping is only about 3% of the absorbed insolation. The geyser-pump collector is found to be as efficient as an electrically pumped collector. Initial costs are estimated to be about the same for the geyser-pump and conventional collectors, but lifetime costs of the geyser-pump are substantially lower, perhaps only half, because of low maintenance. DOE

N86-20971# Fondazione Ugo Bordoni, Rome (Italy).
STATE OF THE ART AND PROSPECTIVES OF PHOTOVOLTAIC SEMICONDUCTOR SOLAR CELLS [STATO DELLARTE E PROSPETTIVE DELLE CELLE SOLARI FOTOVOLTAICHE A SEMICONDUTTORE]
Francesco Barbaliscia and Pier Giorgio Masullo Dec. 1984 48 p refs In ITALIAN
(FUB-30-1984) Avail: NTIS HC A03/MF A01

Solar cell production technology is reviewed. Single crystal solar cells; manufacturing techniques; thin film technology; polycrystalline cells; amorphous silicon cells; condensed light cells; GaAs and CdS cells; laser annealing; and electron beam annealing are discussed. Author (ESA)

N86-20972# AEG-Telefunken, Wedel (West Germany). Anlagentechnik A.G.
THE COMPLETE ELECTRICAL PART OF THE ADVANCED RIGID ARRAY (ARA)-SOLAR ARRAY Final Report
D. Poeck and W. Snakker Paris ESA 1985 52 p
(Contract ESTEC-5523/83-NL-PB(SC))
(ESA-CR(P)-2147) Avail: NTIS HC A04/MF A01

Solar cell type impact on the power to mass ratio of the Advanced Rigid Array (ARA) solar array was investigated. A 50 micron BSFR solar cell with a 50 micron CMX coverglass leads to the highest power to mass ratio at end of life (EOL) in geostationary orbit (10 yr). A 180 micron BSFR solar cell leads to a higher EOL-power to mass ratio than BSR cells assuming an ARA structure of 70 mg/sq cm or thicker. The hold down point sensitivity analysis shows that cell loss near hold down points can be minimized by using different cell dimensions. The harness routing tradeoff and torque measurements show that a separate panel, interpanel, and transfer harness concept is best due to its low mass and good reproducibility of the mechanical torque in the hinge area. Two ARA verification samples were successfully tested for 2000 deep thermal cycles between +80 and -180 C. A third sample of an open lay-up facesheet (minimum weight substrate) was designed and manufactured to meet possible modified mass requirements. Author (ESA)

N86-20926# Joint Publications Research Service, Arlington, Va.
TESTING OF WIND POWER UNITS AT ANTARCTIC STATION
G. Sergeyev *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 50 Transl. into ENGLISH from Vodnyy Transport (Moscow, USSR), 15 Oct. 1985 p 4 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N86-20973# Illinois Commerce Commission, Springfield.
ACID RAIN: ENVIRONMENTAL CONSTRAINTS AND COSTS
Feb. 1985 17 p refs
(TI85-902100; NP-5902100; Sunset-12) Avail: NTIS HC A02/MF A01

The negative financial and economic impact of proposed acid rain legislation could be significant to Illinois utilities and their ratepayers. Emission credit trading/leasing offers hope of being a feasible least cost compliance strategy, but this method of compliance would only be applicable under the bubble approach. The commission and DENR studies on Acid Rain compliance impacts and strategies will assist Illinois in ascertaining the specific approach, or mix of approaches, to compliance best suited to the state. These studies will provide quantitative data on how the various compliance strategies analyzed will affect utility rates. Thus, they will also provide the Commision with useful guidance in adjusting utility rates so as to minimize acid rain compliance costs on Illinois ratepayers. DOE

N86-20974# Washington Univ. Hospital, Seattle. School of Oceanography.
CHEMICAL AND GEOCHEMICAL STUDIES OFF THE COAST OF WASHINGTON Final Progress Report, Jul. 1983 - Jul. 1985
R. Carpenter, comp. Jul. 1985 14 p
(Contract DE-AT06-71EV-70024)
(DE86-000549; DOE/EV-70024/T1) Avail: NTIS HC A02/MF A01

Progress from July 1983 through conclusion in July 1985 of a series of marine chemical and geochemical investigations involving both laboratory studies and field studies off the coast of Washington is summarized. Most of the field work the past few years has been on the Washington continental shelf, slope, and the submarine canyons indenting the shelf north of the Columbia River. The aim has been to provide basic data required to characterize underlying chemical and physical processes and their rates which control the distribution, concentrations, and ultimate fate of some of the potentially hazardous agents associated with fossil fuel and/or nuclear power production or transportation. Laboratory and field experiments and theories derived from them were used iteratively to investigate: (1) vertical transfer of trace chemicals from surface seawaters to underlying waters and sediments; (2) processes which may transfer certain chemicals from sediments back into the overlying water column; (3) redox processes which besides changing valence states of certain chemicals may alter their precipitation/dissolution tendencies, their biological availability and/or toxicity; and (4) accumulation histories of potentially hazardous chemicals in sediments during the past 100 years. DOE

N86-20975# Argonne National Lab., Ill.
ESTIMATION OF SOURCE-RECEPTOR MATRICES FOR DEPOSITION OF NITRATE
J. D. Shannon and B. M. Lesht 1985 16 p Presented at the Muskoka Conference: International Symposium on Acidic Precipitation, Toronto, Ontario, 15 Sep. 1985
(Contract W-31-109-eng-38)
(DE86-001796; CONF-850944-3) Avail: NTIS HC A02/MF A01

Using the Advanced Statistical Trajectory Regional Air Pollution (ASTRAP) model, regional-scale transport and deposition reactions involving NO and NO2 were approximated with a linear, irreversible rate of transformation of combined NO/NO2 to an imprecisely defined NO3(-) species, which combines both nitric acid and particulate nitrate. DOE

N86-20976# Oak Ridge National Lab., Tenn.
INVESTIGATION OF LANDSCAPE AND LAKE ACIDIFICATION RELATIONSHIPS Interim Report
R. M. Rush, R. B. Honea, E. C. Krug, R. W. Peplies, J. E. Dobson, and F. P. Baxter Oct. 1985 39 p
(Contract DE-AC05-84OR-21400)
(DE86-001450; ORNL/TM-9754) Avail: NTIS HC A03/MF A01

This interim report presents the rationale and initial results for a program designed to gather and analyze information essential to a better understanding of lake acidification in the northeastern United States. The literature pertinent to a study of landscape and lake acidification relationships is reviewed and presented as the rationale for a landscape/lake acidification study. The results of a study of Emmons Pond in northwestern Connecticut are described and lead to the conclusion that a landscape change was a contributor to the acidification of this pond. A regional study of sixteen lakes in southern New England using LANDSAT imagery is described, and preliminary observations from a similar study in the Adirondack Mountains are given. These results indicate that satellite imagery can be useful in identifying types of ground cover important to landscape/lake acidification relationships. DOE

N86-20977# Pacific Northwest Lab., Richland, Wash.
IMPACT OF WATER QUALITY ON AQUIFER THERMAL ENERGY STORAGE
R. D. Allen Mar. 1985 6 p Presented at the ENERSTOCK '85 International Conference on Energy Storage for Building Heating and Cooling, Toronto, Ontario, 22 Sep. 1985

(Contract DE-AC06-76RL-01830)
(DE86-001669; PNL-SA-12866; CONF-850905-8) Avail: NTIS HC A02/MF A01

Ground-water quality may affect the regional potential for aquifer thermal energy storage (ATES). Six mechanisms can impair reservoir permeability: (1) particulate plugging, (2) chemical precipitation, (3) liquid-solid reactions, (4) formation disaggregation, (5) oxidation reactions, and (6) biological activity. Countermeasures to reduce these effects are identified. The chemistry of groundwater depends upon solution, precipitation, and fluid mixing. Modeling of water analyses indicated three problem reactions: (1) precipitation of calcium carbonate at elevated temperature; (2) solution of silica at elevated temperature, followed by its precipitation at lowered temperature; and (3) oxidation and precipitation of iron compounds. Aquifers composed of quartz sands and sandstones are promising for low temperature and chilled water storage. Quartz-bearing rocks are promising for high temperature storage, if silica dissolution and precipitation is insignificant. Of the 19 US hydrologic regions reviewed, 10 were identified as having characteristics necessary for ATES development. DOE

N86-20978# Oak Ridge Gaseous Diffusion Plant, Tenn.
COOLING TOWER DRIFT STUDIES AT ORGDP Final Report
S. H. Park and F. G. Taylor, Jr. 31 Jul. 1985 27 p
(Contract DE-AC05-84OT-21400)
(DE85-018438; K/PS-1123) Avail: NTIS HC A03/MF A01

During the 1970s, a major consideration in environmental impact studies of electric power plant operations was the effects of cooling tower drift. In 1973 the distribution and magnitude of drift from mechanical draft cooling towers at the Oak Ridge Gaseous Diffusion Plant (ORGDP), Oak Ridge, Tennessee, was investigated (Taylor et al., 1975). That study provided evidence of the transport and deposition of drift to the terrestrial environment, but only depicted a single season from over three decades of continuous operation. Results of that study suggested that increased quantities of trace elements (chromium) in vegetation attained an equilibrium concentration with environmental losses (weathering, leaching) compensated by chronic deposition. The cooling towers investigated in the 1973 study were built in the early 1950s, but were constantly remodeled and upgraded over this time period. However, 0.03% to 0.1% drift percentage obtained in the 1973 study (Jallouk et al., 1974) was considerably higher than some of similar towers constructed later. The ORGDP diffusion process production rate is varied by changing the operating power level of the plant which, in turn, is related to the recirculating cooling water (RCW) flow rate. Drift fraction is a function of the RCW flow, such that variations (seasonal) in plant operation influence drift emissions. DOE

N86-20979# California Univ., Berkeley. Lawrence Berkeley Lab.
INDOOR CONCENTRATIONS OF RADON 222 AND ITS DAUGHTERS: SOURCES, RANGE, AND ENVIRONMENTAL INFLUENCES
A. V. Nero, Jr. Apr. 1985 27 p Presented at the 7th ORNL Life Sciences Symposium on Indoor-air and Human Health: Major Indoor Air Pollutant and Their Health Implications, Knoxville, Tenn., 29 Oct. 1984
(Contract DE-AC03-76SF-00098)
(DE86-000615; LBL-19346; CONF-8410136-1) Avail: NTIS HC A03/MF A01

The author here reviews what is presently known about factors affecting indoor concentrations of radon 222 and its daughters is reviewed. In US single-family homes, radon concentrations are found to average about 1.5 pCi/1, but substantially higher concentrations occur frequently: perhaps a million US homes have concentrations exceeding 8 pCi/1 (from which occupants receive radiation doses comparable to those now experienced by uranium miners). The major contributor to indoor radon is ordinary soil underlying homes, with this radon being transported indoors primarily by the slight depressurization that occurs toward the bottom of a house interior (due to indoor-outdoor temperature differences and winds). Water from underground sources contributes significantly in a minority of cases, primarily residences with private wells, with public water supplies contributing only a few percent of indoor radon, even when drawn from wells. The strong variability in indoor concentrations is associated primarily with variability in the amount of radon entering homes from these various sources, and secondarily with differences in ventilation rates. However, for a given entry rate, the ventilation rate is the key determinant of indoor concentrations. DOE

N86-20980# European Space Agency, Paris (France).
DFVLR MEASURING SYSTEM FOR THE DETERMINATION OF THE SPATIAL DISTRIBUTION OF ENVIRONMENTAL PARAMETERS OF THE ATMOSPHERE BY MEANS OF MOBILE INSTRUMENTED PLATFORMS
Dieter Paffrath Aug. 1985 73 p refs Transl. into ENGLISH of "DFVLR-Messsystem zur Erfassung der raeumlichen Verteilung von Umweltparametern in der Atmosphaere mit mobilen Messtraegern' Rept. DFVLR-FB-85-09 Oberpfaffenhofen, West Germany, Dec. 1984 Original report in GERMAN previously announced as N85-28472
(ESA-TT-924; DFVLR-FB-85-09) Avail: NTIS HC A05/MF A01; original German version available from DFVLR, Cologne DM 21

Mobile measuring platforms and measurement methods for the quantitative determination of the spatial distribution of air pollution concentration and of meteorological parameters are described. The measuring instruments are installed in a twin-engined airplane for environmental research, in three vector gliders for acquisition of meteorological parameters, in a van for measuring aerosol and air pollution, and in a lidar system container for determination of the horizontal and vertical aerosol distribution.
Author (ESA)

N86-20981# Battelle Columbus Labs., Ohio.
EVALUATION OF POLYURETHANE FOAM CARTRIDGES FOR MEASUREMENT OF POLYNUCLEAR AROMATIC HYDROCARBONS IN AIR Final Report, 1 Aug. - 31 Dec. 1984
C. C. Chuang, W. E. Bresler, and S. W. Hannan Aug. 1985 37 p
(Contract EPA-68-02-3487)
(PB85-245645; EPA-600/4-85-055) Avail: NTIS HC A03/MF A01 CSCL 14B

Polyurethane foam (PUF) cartridges was evaluated as collection media for quantification of vapor phase polynuclear aromatic hydrocarbons (PAHs) in air. Two cleanup methods for PUF cartridges were evaluated. Both methds successfully remove interfering material and background PAHs from the PUF. The compression rinsing method is recommended because it is easier, faster, and cheaper. Two procedures for extraction of PAHs from the PUF matrix, Soxhlet extraction and compression rinsing, were compared. These sample extracts were analyzed by on-column injection, electron impact gas chromatography/mass spectrometry (EI GC/MS) to determine PAHs. The results indicated that the levels of the spiked perdeuterated benzo(a)pyrene decreased significantly during storage. The rate of decrease was much faster when the PUF cartridges were stored in light. Other PAH levels were not adversely influenced by the storage time. GRA

N86-20982# National Oceanic and Atmospheric Administration, Rockville, Md. National Marine Pollution Program Office.
NATIONAL MARINE POLLUTION PROGRAM: AGENCY PROGRAM SUMMARIES FY 1984 UPDATE, APPENDIX NO. 1
Jul. 1985 290 p
(PB86-101953) Avail: NTIS HC A13/MF A01 CSCL 06T

The National Ocean Pollution Planning Act, P.L. 95-273 (as amended), calls or the establishment of a comprehensive, coordinated, and effective Federal program for ocean pollution research, development, and monitoring. Summaries of the major programs conducted by the Federal agencies are given. GRA

N86-20983# National Oceanographic Data Center, Washington, D. C.
NATIONAL MARINE POLLUTION PROGRAM: CATALOG OF FEDERAL PROJECTS FY 1984 UPDATE, APPENDIX NO. 2
Jun. 1985 311 p

(PB86-101961) Avail: NTIS HC A14/MF A01 CSCL 06T

The National Ocean Pollution Planning Act, P.L. 95-273 (as amended), calls for the establishment of a comprehensive, coordinated, and effective Federal program for ocean pollution research, development, and monitoring. The Catalog of Federal Projects is one of a series of documents published by NMPPO to meet the mandates of the National Ocean Pollution Planning Act. Federal programs related to ocean pollution research, development, and monitoring are listed. GRA

N86-20984# National Oceanic and Atmospheric Administration, Boulder, Colo. Air Resources Labs.

ASSESSMENT OF PRECIPITATION CHEMISTRY MEASUREMENTS FROM THE GLOBAL TRENDS NETWORK AND ITS PREDECESSORS, 1972-1982

U. Dayan, A. M. Yoshinaga, D. W. Nelson, and J. M. Miller Apr. 1985 132 p

(PB85-212058; NOAA-TM-ERL-ARL-136) Avail: NTIS HC A07/MF A01 CSCL 04A

The Global Trends Network (GTN) consists of two parts: (1) the routine stations operated directly by NOAA, which are considered a part of the WMO baseline network; and (2) the research network, which is part of the Global Precipitation Chemistry Project directed by the University of Virginia. The precipitation chemistry measurements from the GTN and its predecessors are presented and analyzed. Among the important conclusions from this study are the following: A great improvement has been made in the baseline data with the introduction of weekly sampling in 1980, no obvious trends can be detected in the 10-year record, the average hydrogen ion concentration is about pH 5.0 in remote areas. For certain individual events this can be much lower, and the sulfate values in remote locations are about 10 times less than those found in polluted areas. GRA

N86-20927# Joint Publications Research Service, Arlington, Va.

POLLUTION OF ARCTIC SEAS BY RADIOACTIVE WASTES OF WEST EUROPEAN ATOMIC INDUSTRY PLANTS Abstract Only

S. M. Vakulovskiy, A. I. Nikitin, and V. B. Chumichev *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 52 Transl. into ENGLISH from Atomnaya Energiya (Moscow, USSR), v. 58, no. 6, Jun. 1985 p 445-449 (For primary document see N86-20887 11-42)

Avail: NTIS HC A04

N86-21037 Rheinisch Westfaelische Technischer Ueberwachungs-Verein e.V., Essen (West Germany).

MEASUREMENTS OF CARBON MONOXIDE IMMISSIONS FOR DETERMINATION OF THE CONCENTRATION DIFFERENCES BETWEEN OPEN AIR AND INDOOR AIR VALUES [MESSUNGEN VON KOHLENWASSERSTOFFIMMISSIONEN ZUR ERMITTLUNG VON KONZENTRATIONSUNTERSCHIEDEN ZWISCHEN FREI-LAND- UND RAUMLUFTWERTEN]

Juergen Frank *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium Human Biometeorology 13 Aug. 1985 p 65-66 In GERMAN (For primary document see N86-21012 11-47)

Avail: Issuing Activity

N86-21048 Basel Univ. (Switzerland).

A SIMPLE PROCEDURE FOR SEMI-QUANTITATIVE DETERMINATION OF DUST IN AIR [EINE EINFACHE, WENIG AUFWENDIGE METHODE ZUR HALBQUANTITATIVEN BESTIMMUNG VON STAUB IN DER LUFT]

Gundo Boehm *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 92-94 refs In GERMAN (For primary document see N86-21012 11-47)

Avail: Issuing Activity

N86-21052 Kaiserslautern Univ. (West Germany). Fachbereich ARUBi.

MISSIONS AND INSTRUMENTS OF REGIONAL AND LAND PLANNING [AUFGABEN UND INSTRUMENTE DER REGIONAL- UND LANDESPLANUNG]

Dieter Eberle *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 104-105 refs In GERMAN (For primary document see N86-21012 11-47)

Avail: Issuing Activity

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N86-20985 Pennsylvania State Univ., University Park.

THE ORIGIN AND EVOLUTION OF A CONTINENTAL VOLCANO: INDEPENDENCE, MONTANA Ph.D. Thesis

James Kenneth Meen 1985 953 p

Avail: Univ. Microfilms Order No. DA8516068

A volcano, Independence, in the Absaroka Mountains, Montana was studied. Its igneous record to elucidate the genesis of the volcanic rocks and the composition of the lithosphere in the Bearthooth region was studied. The magma parental to most of the extrusive rocks was a high magnesium andesite; the parent of the Independent stock was a basaltic andesite. Both these magmas evolved by precipitation of plagioclass-rich, olivine-free, magnetite-bearing assemblages of potassic compositions. Crustal contamination-fractional crystallization produced liquid lines of descent with only moderate potash enrichment. Minor crustal rock types can be important contaminants and can produce unexpectedly large deviations n the isotopic compositions of contaminated rocks. The mantle-derived rocks have low (Nd-143, Nd-144), and moderate (Sr-87/SR-86), which reflect the composition of the sub-Bearthooth mantle. The Pb-isotopic compositions of the high-magnesium andesites suggest that enrichment occurred 3.8 By ago. The Pb-isotopic compositions of the anatectites define a 3.3 By isochron, interpreted as the age of regional homogenization of the deep crust. Dissert. Abstr.

N86-20986 Washington Univ., Seattle.

GRAVITATIONAL RADIATION IN A NONSYMMETRIC GRAVITATIONAL THEORY Ph.D. Thesis

Timothy Philip Krisher 1985 112 p

Avail: Univ. Microfilms Order No. DA8520804

The properties of gravitational radiation in a nonsymmetric gravitational theory (NGT) proposed by Moffat that is based on a nonsymmetric metric and affine connection were analyzed. A generalized formalism is developed for determining the physically observable polarization modes of weak, plane gravitational waves in nonsymmetric theories of gravitation. For the case of NGT, it is found that a Lorentz-invariant description of gravitational waves is possible if a transposition-invariant definition of measurable geodesic deviation is adopted for the theory. The generation of gravitational radiation is examined and it is shown that NGT predicts the emission of dipole gravitational radiation from a binary system. The source of the dipole radiation is a vector density S postulated to be proportional to the number density of fermion particles in the components of the system. This radiation results in a secular decrease in the orbital period of a binary system in addition to that predicted by general relativity. Constriction of the theory might be constrained by observations of the binary pulsar PSR 1913 + 16 and the cataclysmic binary AM CVn. Dissert. Abstr.

N86-20987 Washington Univ., Seattle.

ON THE ELECTRICAL HETEROGENEITY OF THE EARTH'S INTERIOR: A GLOBAL STUDY OF MID-MANTLE CONDUCTIVITY Ph.D. Thesis

Adam Schultz 1985 256 p

Avail: Univ. Microfilms Order No. DA8521654

Deep global electrical conductivity structure was studied by

inversion of a large collection of independent electromagnetic response functions calculated for a variety of tectonic provinces on the earth's surface. A response function (Z/H) is estimated by assuming the geomagnetic field is principally P sub 1 deg. The response is scaled into an equivalent scalar magnetotelluric impedance and inverted using both Backus-Gilbert linarizations and extremal nonlinear solutions. Simultaneous D sup + inversion of joint response functions from pairs of observatories was carried out. Electrical heterogeneity within the mantle is shown to be required to fit the data. The range of acceptable H sup + models was systematically evaluated. A much large permissible model range is seen for observatories within the Pacific Margin and Baikal Rift Zone then for observatories distant from these regions. Enhanced upper model conductivity is the preferred explanation for this effect. Dissert. Abstr.

N86-20988 Cornell Univ., Ithaca, N.Y.
THE CONTINENTAL LOWER CRUST AND MOHO: STUDIES USING COCORP DEEP SEISMIC REFLECTION PROFILING Ph.D. Thesis
Simon Louis Klemperer 1985 159 p
Avail: Univ. Microfilms Order No. DA8516895

Seismic reflection profiling was used to map the lower crust and Moho in diverse areas of the U.S.A. The best reflections yet detected from the Moho were recorded and used to constrain interpretations of the age and formation of the Moho. The seismic character of the Moho in Nevada is unchanged across a province which experienced complex, pre-Cenozoic, accretion-related phenomena. This suggest that the Moho in the Basin and range may be a Cenozoic feature, presumably related to the volcanism and/or the extension that characterize the Cenozoic history of the Basin and Range province. In the Adirondack mountains of New York, a Proterozoic compressional orogen, an unusualy layered structure in the lower crust was identified. It is found that the in situ lower crust has a very different seismic character from that of the present-day upper crust, even though the upper crust has been uplifted from depths greater than 20 km. Simulations of various noise rejection procedures are compared, to select appropriate methods for mitigating the adverse effects of noise bursts. A computer noise rejection method is presented which provides effective removal of noise bursts while preserving the true amplitude characteristics of the recorded data. Dissert. Abstr.

N86-20989 California Univ., San Diego.
EXACT NONLINEAR INVERSION OF ELECTROMAGNETIC INDUCTION SOUNDINGS Ph.D. Thesis
Giovanni B. Marchiso 1985 187 p
Avail: Univ. Microfilms Order No. DA8517909

Exact solutions to the inverse problem of recovering the one-dimensional conductivity structure of the Earth from incomplete and imprecise measurements its impedance at the surface are presented. The new approach relies on the mapping between a spectral expansion representation for the complex responses and the corresponding conductivity distributions, when the exponential attenuation of the electromagnetic fields with depth is incorporated in a fully nonlinear mathematical model. Two different construction techniques are developed: (1) an adaptation of the Gel'fand and Levitan method for scattering from Bargmann-type potentials; (2) the original time-domain formulation for the equivalent scattering problem. The introduction of boundary conditions at h gives rise to an eigenvalue problem. Implementation of linear constraints in lambda gives control on the values of the conductivity and conductivity gradient at the surface, effective penetration depth, nature of the boundary condition at the bottom, presence or absence of an insulating layer at the surface. All these constraints are enforced simultaneously by a direct, noniterative algorithm which provides solutions with misfit arbitrarily close to the smallest one possible for sets of real data. The potential of the new interpretation technique is demonstrated with results from the inversion of long period MT oceanic and land data. Dissert. Abstr.

N86-20990 State Univ. of New York, Buffalo.
ON APPLICATION OF NON-ISOTHERMAL VISCOELASTICAL THEORY TO THE GEOPHYSICAL PLATE SUBDUCTION PROBLEM Ph.D. Thesis
Pongdet Wipasuramonton 1985 139 p
Avail: Univ. Microfilms Order No. DA8518787

The basic equilibrium, constitutive and deformation equations are developed for a nonisothermal, nonlinear viscoelastic beam, which is undergoing large rotation. A nonlinear Maxwell constitutive law with temperature dependent viscosity and with thermal expansion is employed. The formulation is specialized for the case of a steadily moving load, whereupon the time and longitudinal space variables may be combined into a single variable. The formulation is focused on the geophysical plate subduction problem. This problem consists of a slowly moving nonlinear viscoelastic slab with large geothermal gradients, which is subjected to large rotations during a subduction that is primarly indicated by the weight of the slab. Since displacements are known at several points via seismic evidence wherein some of the loads are unknown, the problem falls into the class of an inverse multipoint boundary value problem. The formulation and method of solution is applied to solve an inverse four-point boundary problem for the North Tonga Trench subduction zone. Interplate normal and friction forces, static and dynamic pressures, and internal forces and stresses are determined and discussed. Dissert. Abstr.

N86-20991# Oak Ridge Associated Universities, Inc., Tenn.
REVIEW OF CARBON DIOXIDE RESEARCH STAFFING AND ACADEMIC SUPPORT
Sheldon B. Clark, Lee Howard, Wayne Stevenson, and Jan Trice Apr. 1985 120 p refs Prepared for DOE, Washington, D.C.
(Contract DE-AC05-76OR-00033)
(DOE/NBB-0068) Avail: NTIS HC A06/MF A01

More than 60 percent of the staff on Carbon Dioxide Research Division (CDRD) projects were university affiliated, and over one third of project scientists and engineers also had university teaching responsibilities. Almost 20 percent of project staff were students. CO2 research is unlikely to affect the general labor market for scientists and engineers because it uses such a small portion of the total pool. On the other hand, anticipated tight labor markets in some disciplines important to CO2 research may make it advantageous for CDRD to expand its support of university faculty, students, and staff to ensure that competent, knowledgeable researchers and managers are available for eventual policy decisions on CO2 issues. Options for academic support that lend themselves readily to the diffuse nature of CO2 research, while providing flexibility in the identification and accomplishment of specific programmatic objectives, include modifying procurement procedures for research contracts to enhance academic involvement, sponsoring summer institutes tailored to specific participants and focused on issues of interest to CDRD, and supporting traveling lecture programs designed to bring information of concern to CDRD to technical and nontechnical audiences. Author

N86-20992*# National Academy of Sciences - National Research Council, Washington, D. C. Committee for an International Geosphere-Biosphere Program.
GLOBAL CHANGE IN THE GEOSPHERE-BIOSPHERE: INITIAL PRIORITIES FOR AN IGBP
1986 104 p
(Contracts NAS2-3985; NASw-4056; DE-FG05-84ER-602777; Grant N00014-84-G-0196)
(NASA-CR-176519; NAS 1.26:176519) Avail: NTIS HC A06/MF A01 CSCL 04A

Some of the factors are outlined that leads one to endorse the concept of focused, international geosphere-biosphere program, whose goal is to understand the interactive physical, chemical, and biological processes that regulate the Earth's unique environment for life, the changes that are occurring in this system, and the manner in which they are influenced by human actions. There is a pressing need to assess the consequence of human activities in the context of natural global change and to provide the body of knowledge necessary to chart a wise course to the future. A number of specific objectives were developed which leads to the conclusion that the need for new programs of observation

of the Earth as a planet, a better understanding of the interactive processes that governs its changes, the development of a new generation of coupled modes, and the design of suitable tests to guide the development of these models and the understanding of the processes involved. Some general recommendations are summarized. Author

N86-20993# Danish Space Research Inst., Lyngby.
POLAR IONOSPHERIC E-REGION PLASMA WAVE STABILIZATION AND ELECTRON HEATING BY WAVE-INDUCED ENHANCEMENT OF THE ELECTRON COLLISION FREQUENCY
F. Primdahl 1985 23 p refs Presented at the Nordic Symposium on Nonlinear Waves in Plasmas, Roskilde, Denmark, 13-16 Aug. 1985
(DRI-5-85; ISSN-0109-6605) Avail: NTIS HC A02/MF A01

Comparative measurements indicate that the phase velocity of low frequency waves in the ionospheric E region is often lower than the drift speed of the electrons that drive the waves unstable. In order to understand these results, the linear instability theory is modified to conform with zero growth rate even above threshold. The result is that the waves travel at the ion acoustic velocity with an amplitude stabilized at the observed level, and also that the electron gas is substantially heated by the wave. Author

N86-20994*# Massachusetts Inst. of Tech., Cambridge.
CHARACTERIZATION OF POTENTIAL SOURCES OF MAGNETIC ANOMALIES WITHIN THE CRUST IN A TECTONICALLY ACTIVE REGION: AMPHIBOLITES AND MIGMATITES FROM POTRILLO MAAR, NEW MEXICO Final Report
Frank S. Spear and Elaine Padovanni 2 Dec. 1985 11 p refs
(Grant NAG5-147)
(NASA-CR-176385; NAS 1.26:176385) Avail: NTIS HC A02/MF A01 CSCL 08G

The purpose was to characterize the oxide mineralogy and petrology of samples collected from Potrillo Maar, New Mexico with the goal of explaining the magnetic anamoly that is observed over this region from remote sensing. Potrillo Maar is a diatreme that has brought rocks from all depths in the crust to the surface almost instantaneously. The samples are therefore thought to be representative of the crust as it exists today below this portion of the Rio Grande Rift. It is generally believed that oxide minerals (magnetite, hematite, etc.) are responsible for the magnetic signature of the crust. The samples from Portillo Maar therefore offer a unique opportunity to examine the magnetic mineralogy of the entire crust. The results indicate that the magnetic anamoly observed over Rio Grande Rift may be consequence of the tectonic activity that caused mylonitization of the rocks and allowed the infiltration of oxidizing fluids. R.J.F.

N86-20995*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
THE CALCULATION OF THEORETICAL CHROMOSPHERIC MODELS AND THE INTERPRETATION OF SOLAR SPECTRA FROM ROCKETS AND SPACECRAFT Semiannual Report, 1 Jan. - 31 Dec. 1985
Eugene H. Avrett Feb. 1986 68 p refs
(Grant NsG-7054)
(NASA-CR-176573; NAS 1.26:176573; SAR-20; SAR-21) Avail: NTIS HC A04/MF A01 CSCL 04A

Calculated results based on two chromospheric flare models F1 and F2 of Machado, et al., (1980) are presented. Two additional models are included: F1*, which has enhanced temperatures relative to the weak-flare model F1 in the upper photosphere and low chromosphere, and F3 which has enhanced temperatures relative to the strong flare model F2 in the upper chromosphere. Each model is specified by means of a given variation of the temperature as a function of column mass. The corresponding variation of particle density and the geometrical height scale are determined by assuming hydrostatic equilibrium. The coupled equations of statistical equilibrium is solved as is radiative transfer for H, H-, He I-II, C I-IV, Si I-II, Mg I-II, Fe, Al, O I-II, Na, and Ca II. The overall absorption and emission of radiation by lines throughout the spectrum is determined by means of a reduced set of opacities sampled from a compilation of over 10 to the 7th power individual lines. That the white flight flare continuum may arise by extreme chromospheric overheating as well as by an enhancement of the minimum temperature region is also shown. The radiative cooling rate calculations for our brightest flare model suggest that chromospheric overheating provides enhanced radiation that could cause significant heating deep in the flare atmosphere. Author

N86-20996*# California Univ., Santa Barbara.
NEOTECTONICS OF THE SAN ANDREAS FAULT SYSTEM: BASIN AND RANGE PROVINCE JUNCTURE Final Report, 1 May 1981 - 15 Mar. 1986
John E. Estes and John C. Crowell 1986 14 p
(Grant NAG5-177)
(NASA-CR-176562; NAS 1.26:176562) Avail: NTIS HC A02/MF A01 CSCL 08G

Several new details regarding the surficial patterns of neotectonic activity of the Eastern Transverse Ranges and vicinity were discovered. Additionally a number of data display and analysis techniques were developed. These findings will be useful both in the continued development of neotectonic models for southern California and for the future application of remote sensing methodologies elsewhere. Author

N86-20997*# Business and Technological Systems, Inc., Seabrook, Md.
GEOMAGNETIC MAIN FIELD MODELING USING MAGNETOHYDRODYNAMIC CONSTRAINTS
Ronald H. Estes Nov. 1985 33 p refs
(Contract NAS5-28671)
(NASA-CR-177849; NAS 1.26:177849; BTS03-85-51/k1; Rept-1080) Avail: NTIS HC A03/MF A01 CSCL 08G

The influence of physical constraints are investigated which may be approximately satisfied by the Earth's liquid core on models of the geomagnetic main field and its secular variation. A previous report describes the methodology used to incorporate nonlinear equations of constraint into the main field model. The application of that methodology to the GSFC 12/83 field model to test the frozen-flux hypothesis and the usefulness of incorporating magnetohydrodynamic constraints for obtaining improved geomagnetic field models is described. Author

N86-20998# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
MIDDLE ATMOSPHERIC-ELECTRODYNAMIC MODIFICATION BY SOLAR ACTIVITY AT THE SOUTH ATLANTIC MAGNETIC ANOMALY
W. D. Gonzalez, S. L. G. Dutra, and O. Pinto, Jr. Oct. 1985 20 p refs Sponsored in part by Fundo Nacional de Desenvolvimento Cientifico e Tecnologico Submitted for publication
(INPE-3692-PRE/837) Avail: NTIS HC A02/MF A01

Evidences for a localized middle atmospheric electrodynamic modification at low latitudes of the South Atlantic Magnetic Anomaly (SAMA), in association with enhanced geomagnetic activity, are presented in a unified way combining recent observational efforts and related numerical studies. X-ray and electric field measurements suggest the occurrence of a distortion effect in the fair weather electric field at balloon altitudes. This effect is attributed to a local intensification of energetic electron precipitation through a related middle atmospheric ionization enhancement and is elucidated by numeric simulation. From electric field measurements and numeric simulation, intensification of precipitation is argued to occur on fairly narrow regions at the observed low L values of the SAMA, with horizontal extensions of the order of few hundred km. A physical mechanism that could be responsible for this sort of intensification is suggested. A comparison of the phenomenum of middle atmospheric electrodynamic modification at the SAMA with a similar one at auroral latitudes is also given. Author

N86-20999# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
DOWNWARD MAPPING OF EQUATORIAL IONOSPHERIC ELEC-

TRIC FIELDS
W. D. Gonzalez, S. L. G. Dutra, A. L. C. Gonzalez, and A. E. C. Pereira (Univ. Federal de Uberlandia, Brazil) Oct. 1985 15 p refs Submitted for publication Sponsored in part by Fundo Fundo Nacional de Desenvolvimento Cientifico e Tecnologico
(INPE-3665-PRE/822) Avail: NTIS HC A02/MF A01

The problem of downward mapping of equatorial ionospheric electric fields is studied in two dimensions. Numerical solutions are shown and are compared with the corresponding ones for high latitudes. It is found that ionospheric electric fields can map down in the equatorial atmosphere with negligible attenuation when the scale lengths of those fields are of the order or larger than 100 km. On the other hand, when the scale lengths are of the order of some tens of kilometers the electric fields are severely attenuated, with the attenuation factors being even larger than the corresponding ones at high latitudes. Author

N86-21000# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PERIODICITIES IN THE INTERPLANETARY MAGNETIC FIELD POLARITY
A. L. C. Gonzalez and W. D. Gonzalez Oct. 1985 50 p Submitted for publication Sponsored by Fundo Nacional de Desenvolvimento Cientifico e Tecnologico
(INPE-3677-PRE/828) Avail: NTIS HC A03/MF A01

The daily data of the polarity of the interplanetary magnetic field for the years 1926 to 1982 were studied by means of a power spectrum analysis in order to determine prevailing structures of this polarity as well as to search for recurrence in those structures. On a global scale, it was observed that presence of significant peaks at about 25.5, 13.5, 9.1 and 6.8 years, with amplitudes decreasing in that same order. These results are interpreted, through a simulation with rectangular waves, as cases that correspond either to a two sector or to a four sector structure, when the dominant peak is that of about 27.5 or 13.5 days, respectively. Thus, by performing an annual survey of the data, it was found that there is a continuous change in the type of dominant structure, with intervals having a well defined two sector structure and being alternated by others with a less defined structure or even with a well defined four sector structure. These periodicities become important when compared to similar ones reported in studies of solar and geomagnetic activity. Other less significant periodicities in this alternated variability are also reported and discussed. Author

N86-21001# Air Force Geophysics Lab., Hanscom AFB, Mass.
DETERMINATION OF IONOSPHERIC ELECTRON DENSITY PROFILES FROM SATELLITE UV (ULTRAVIOLET) EMISSION MEASUREMENTS, FISCAL YEAR 1984 Environmental Research Papers, Feb. 1984 - Feb. 1985
R. E. Daniell, D. J. Strickland, D. T. Decker, J. R. Jasperse, and H. C. Carlson, Jr. 26 Apr. 1985 66 p
(AF Proj. 4643)
(AD-A160368; AFGL-TR-85-0099; AFGL-ERP-913) Avail: NTIS HC A04/MF A01 CSCL 04/1

The possible use of satellite ultraviolet measurements to deduce the ionospheric electron density profile (EDP) on a global basis is discussed. During 1984 comparisons were continued between the hybrid daytime ionospheric model and the experimental observations. These comparison studies indicate that: (1) the essential features of the EDP and certain UV emissions can be modelled; (2) the models are sufficiently sensitive to input parameters to yield poor agreement with observations when typical input values are used; (3) reasonable adjustments of the parameters can produce excellent agreement between theory and data for either EDP or airglow but not both; and (4) the qualitative understanding of the relationship between two input parameters (solar flux and neutral densities) and the model EDP and airglow features has been verified. The development of a hybrid dynamic model for the nighttime midlatitude ionosphere has been initiated. This model is similar to the daytime hybrid model, but uses the sunset EDP as an initial value and calculates the EDP as a function of time through the night. In addition, a semiempirical model has been developed, based on the assumption that the nighttime EDP is always well described by a modified Chapman function. This model has great simplicity and allows the EDP to be inferred in a straightforward manner from optical observations. Comparisons with data are difficult, however, because of the low intensity of the nightglow. GRA

N86-21002# Naval Research Lab., Washington, D. C.
DYNAMICS OF THE LARGE SCALE RETURN CURRENTS ON AURORAL FIELD LINES
Supriya B. Ganguli, H. G. Mitchell, Jr., and P. J. Palmadesso 11 Nov. 1985 42 p
(RR0-3302)
(AD-A161697; NRL-MR-5673) Avail: NTIS HC A03/MF A01 CSCL 04/1

Multimoment fluid plasma simulations have been performed to study the dynamics of auroral field lines in the presence of large scale field-aligned return currents. The flux tube plasma has a rapid initial response to the onset of current. Electron velocity increases with the application of return current to the system. Electron temperature exhibits adiabatic cooling and temperature anisotropy but the electrons cool much more compared to their polar wind value. We have only considered cold ionospheric electrons in this simulation. The hydrogen iron drift velocity decreases and hydrogen ion temperature increases. The hydrogen ion temperature still exhibits the polar wind characteristics, i.e., the increase in temperature at the lower end of the tube, temperature anisotropy and adiabatic cooling. GRA

N86-21003# Rogers, Golden and Halpern, Inc., Reston, Va.
ARCTIC SUMMARY REPORT: OUTER CONTINENTAL SHELF OIL AND GAS ACTIVITIES IN THE ARCTIC AND THEIR ONSHORE IMPACTS
Christopher Lynch, Douglas L. Slitor, and Robert W. Rudolph Jan. 1985 111 p
(Contract DI-14-12-0001-30042)
(TI85-901863; M85901863; OCS/MMS-85-0022) Avail: NTIS HC A06/MF A01

Issues and developments occuring in the Arctic Outer Continental Shelf subregion are discussed. The geology and hydrocarbon potential of the Diapir Field petroleum provinces are detailed. Recent lease sales, exploration activities, and the first development proposals for offshore areas of the North slope are considered. Issues relating to transporting resources from production islands to shore and various proposals for moving Arctic hydrocarbons to market are presented. Production projects onshore and possible support bases for offshore activity are also examined. E.R.

N86-21004# Geological Survey, Denver, Colo.
INVESTIGATION OF AN AEROMAGNETIC ANOMALY ON WEST SIDE OF YUCCA MOUNTAIN, NEY COUNTY, NEVADA
G. D. Bath and C. E. Jahren 1985 29 p refs
(Contract DE-AI08-78ET-44802)
(DE85-018329; USGS-OFR-85-459) Avail: NTIS HC A03/MF A01

Investigations of the source of a prominent aeromagnetic anomaly of 290 nT were undertaken at a potential repository site located in the Yucca Mountain area, Nevada Test Site. The anomaly was detected on a recent flight line of a survey flown north-south at 400 m (1300 ft) spacing and 122 m (400 ft) above the surface. The anomaly, which is on the high-standing side of a major fault, was interpreted previously as arising from either an increase of magnetization within a volcanic tuff or a small intrusive feature. Both air and ground anomalies were analyzed using geologic data from surface mapping and drill holes, and magnetic property data from drill holes. The anomaly is caused by contributions from at least three sources. The elevated topography gives a terrain effect since the altitude is decreased between the airplane and exposed Topopah Spring Member of the Paintbrush Tuff. Ground anomalies 300 m (1000 ft) south of the air maximum indicate either an increase in magnetization or the presence of a small intrusive body. Finally, there is an increase in magnetic influence from the nearby Solitario Canyon fault. DOE

N86-21005# Lawrence Livermore National Lab., Calif.
DEPTH DISTRIBUTIONS OF SEISMICITY IN THE EAST SAN FRANCISCO BAY REGION
J. Scheimer Aug. 1985 25 p refs
(Contract W-7405-eng-48)
(DE86-001612; UCID-20522) Avail: NTIS HC A02/MF A01

Depth distributions of seismicity are given for nine seismic source zones in the Livermore Valley Region. The dataset used covers the time period from 1969 through 1982. Most seismicity, in all zones, occurs between the depths of 3.5 km and 15 km. DOE

N86-21006# Lawrence Livermore National Lab., Calif.
HEMP INTERNAL COUPLING PHENOMENOLOGY STUDY
K. S. Kunz, H. G. Hudson, J. K. Breakall, R. J. King, R. Ziolkowski, N. Madsen, J. Peterson, and S. T. Pennock Sep. 1985 122 p
(Contract W-7405-eng-48)
(DE86-001439; UCID-20542) Avail: NTIS HC A06/MF A01

The electromagnetic coupling problem associated with the interaction of the high altitude electromagnetic pulse HEMP) with typical aerospace systems is studied. A bottom up approach to this task has been selected. Tools are developed for measuring and predicting the responses of simple test systems; from these measurements and predictions phenomenological understanding of the coupling mechanisms may be obtained and the tools may be verified. The construction and the experimental characterization of a test system embodying the fundamental features of an interior coupling problem, is discussed. Experimental, computational and analytical tools has been applied to this test system. Experimental measurements have revealed a pronounced modal interior response which has been closely replicated with the time domain three dimensional finite difference code G3DXL3. The persistence of these modes has been established analytically with an N-series analysis. Focusing and reflection effects as well as hot spot formation have been examined with the N-series analysis and with a time domain two-dimensional finite element code GEM2D. DOE

N86-21007# Construcciones Aeronauticas S.A., Madrid (Spain). Investigacion y Desarrollo de Tecnologia y Materiales.
INFRARED SPECTROSCOPY [ESPECTROSCOPIA INFRARROJA]
Belen Alvarez Lopez 28 Nov. 1984 53 p In SPANISH
(I-102/84) Avail: NTIS HC A04/MF A01

Infrared spectroscopic analysis is reviewed. Applications to chemical analysis of preimpregnated carbon fiber materials, including polystyrene spectra, epoxy resin analysis, mineral loads analysis, determination of epoxy groups and identification of spurious organic materials are discussed. The advantages of the method for quality control are pointed out. Author (ESA)

N86-21008# National Oceanic and Atmospheric Administration, Boulder, Colo. World Data Center A for Solid Earth Geophysics.
CATALOG OF STRONG-MOTION ACCELEROGRAPH RECORDS
J. L. Coffman and S. Godeaux Jun. 1985 90 p
(PB85-233120; SE-38) Avail: NTIS HC A05/MF A01 CSCL 08K

The National Geophysical Data Center (NGDC) and its collocated World Data Center-A for Solid Earth Geophysics (WDC-A) are responsible for acquiring, archiving, and disseminating strong-motion accelerograph data to meet requirements of the scientific and technical community. The U.S. Geological Survey (USGS) has provided most of the digital data now in the strong-motion archive froms its National Strong-Motion Instrumentation Network. The present catalog contains information on all digital accelerograph records in the archives of NGDC and WDC-A. The date, time, epicenter, magnitude, depth, and intensity of each triggering earthquakes is reported. The recording station, geographic location, date of record, type of accelerograph, component, acceleration, velocity, and displacement is given. GRA

N86-21009# National Oceanic and Atmospheric Administration, Boulder, Colo. World Data Center A for Solar-Terrestrial Physics.
COMBINED INTERNATIONAL CATALOG OF GEOMAGNETIC DATA
C. C. Abston, N. E. Papitashvili, and V. O. Papitashvili Jul. 1985 303 p
(PB85-235570; UAG-92) Avail: NTIS HC A14/MF A01 CSCL 08N

The Combined International Catalog of Geomagnetic Data attempts to: (1) consolidate all the geomagnetic data from standard, rapid-run, and digital measurements known to exist at all of the World Data Centers having responsibility for geomagnetic data; (2) indicate years of geomagnetic observatory operation from 1810; (3) provide the observed or simulated absolute 1980 values for all listed observatories; (4) provide first and most recent annual values for all listed observatories; (5) provide a list of alternate observatory names, and (6) provide a digital section including catalog inventory formats, data base design and all associated software coding necessary to manage, update, and produce the tables published here. The World Data Centers with geomagnetic data holdings are located in Bombay, Boulder, Copenhagen, Edinburg, Kyoto, and Moscow. Their holdings include data recorded before the IGY (when the WDC system was established). GRA

N86-21010# Systems Applications, Inc., San Rafael, Calif.
SAI (SYSTEMS APPLICATIONS, INCORPORATED) AIRSHED MODEL OPERATIONS MANUALS. VOLUME 2: SYSTEMS MANUAL Report, Aug. 1976 - Sep. 1979
J. Ames, S. R. Hayes, T. C. Myers, and D. C. Whitney Apr. 1985 248 p refs
(Contract EPA-68-02-2429)
(PB85-191575; EM78-79R2-Vol-2; EPA-600/8-85-0078) Avail: NTIS HC A11/MF A01 CSCL 04A

The SAI Airshed Model System is described fro a programmer's point of view. Included are discussions of all subroutines and how they fit together, run-time core allocation techniques, internal methods of segment handling using secondary storage, and detailed definitions of the structure of each file in the ystem. This manual also includes suggestions for implementing the programs on different computers. The SAI Airshed Model System consists of 17 programs that communicate with each other through 17; data files; both the programs and files are described in detail in this manual. An overview briefly describing the programs used to perform each of the five system functions is presented. Guidelines for implementing the programs, detailed descriptions of the programs by function, including hierarchical subroutine tables and short module descriptions, and detailed file structure definitions for each file in the system are given. GRA

N86-20449# Joint Publications Research Service, Arlington, Va.
NEW METHOD FOR GEOLOGICAL INTERPRETATION OF ANNULAR STRUCTURES WITHIN COVERED AND PARTIALLY COVERED AREAS Abstract Only
B. S. Zeylik, L. G. Perfilyev, A. N. Vasilenko, and E. Yu. Seytmuratova *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 66 Transl. into ENGLISH from Issledovaniye Zemli Iz Kosmosa (Moscow, USSR), no. 4, Jul. - Aug. 1985 p 31-40 Original language document was announced in IAA as A86-13279 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

N86-20452# Joint Publications Research Service, Arlington, Va.
IDENTIFICATION OF NATURAL FORMATIONS FROM RESULTS OF SPECTRAL-ENERGY MEASUREMENTS FROM SPACE Abstract Only
L. I. Kiselevskiy, A. A. Kovalev, and V. Ye. Plyuta *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 69-70 Transl. into ENGLISH from Issledovaniye Zemli Iz Kosmosa (Moscow, USSR), no. 4, Jul. - Aug. 1985 p 98-104 Original language document was announced in IAA as A86-13287 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

N86-20453# Joint Publications Research Service, Arlington, Va.
CLASSIFICATION OF NATURAL FORMATIONS BASED ON

THEIR OPTICAL CHARACTERISTICS USING SMALL VOLUMES OF SAMPLES Abstract Only
N. S. Abramovich, A. A. Kovalev, and V. Ye. Plyuta *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 70 Transl. into ENGLISH from Issledovaniye Zemli Iz Kosmosa (Moscow, USSR), no. 4, Jul. - Aug. 1985 p 105-111 Original language document was announced in IAA as A86-13288 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

N86-20892# Joint Publications Research Service, Arlington, Va.
RESEARCH SHIP ZUBOV TO LAUNCH WEATHER ROCKETS IN ATLANTIC
T. Volgina *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 10 Transl. into ENGLISH from Leningradskaya (Leningrad, USSR), 14 Aug. 1985 p 4 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

N86-20906# Joint Publications Research Service, Arlington, Va.
STRUCTURE OF SEDIMENTARY COVER OF RED SEA DETERMINED FROM SEISMIC DATA Abstract Only
I. N. Yelnikov and L. P. Zonenshayn *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 26 Transl. into ENGLISH from Geotektonika (Moscow, USSR), no. 4, Jul. - Aug. 1985 p 110-122 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

N86-20907# Joint Publications Research Service, Arlington, Va.
PATTERNS OF RELATIVE POSITIONING OF OCEANIC RIFTS AND TRANSFORM FAULTS Abstract Only
N. Yu. Bocharova, Ye. G. Mirlin, and K. V. Popov *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 26-27 Transl. into ENGLISH from Geotektonika (Moscow, USSR), no. 4, Jul. - Aug. 1985 p 100-109 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

N86-20916# Joint Publications Research Service, Arlington, Va.
RADON AS INDICATOR OF PERMEABILITY ZONES FOR STEAM HYDROTHERMS Abstract Only
A. M. Rozhkov *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 41 Transl. into ENGLISH from Vulkanologiya I Seysmologiya (Moscow, USSR), no. 3, May - Jun. 1985 p 78-82 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

N86-20918# Joint Publications Research Service, Arlington, Va.
NEOTECTONICS AND VOLCANISM IN EASTERN VOLCANIC ZONE OF KAMCHATKA Abstract Only
I. V. Florenskiy and V. G. Trifonov *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 42 Transl. into ENGLISH from Geotektonika (Moscow, USSR), no. 4, Jul. - Aug. 1985 p 78-87 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

N86-20920# Joint Publications Research Service, Arlington, Va.
SOUND RADIATION IN ATMOSPHERE DURING UNDERWATER EARTHQUAKE Abstract Only
S. P. Vdovichenko and Yu. M. Zaslavskiy *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 45 Transl. into ENGLISH from Izvestiya Akademii Nauk SSSR: Fizika Atmosfery I Okeana (Moscow, USSR), v. 21, no. 7, Jul. 1985 p 714-719 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

N86-20923# Joint Publications Research Service, Arlington, Va.
INTERNAL GRAVITY WAVES, FLUCTUATIONS OF SOLAR ULTRAVIOLET RADIATION AND IONOSPHERIC PARAMETERS Abstract Only
R. S. Steblova, I. A. Freyzon, V. V. Koltsov, Ye. I. Chertok, Yu. V. Gorokhov, V. A. Vazherkin, I. N. Panova, and M. G. Kogan *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 47 Transl. into ENGLISH from Doklady Akademii Nauk SSSR (Moscow, USSR), v. 283, no. 2, Jul. 1985 p 353-357 Previously announced in IAA as A85-46032 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N86-21011 Saint Louis Univ., Mo.
THE EFFECT OF HIGHER RESOLUTION AND IMPROVED FORMULATION OF SURFACE FLUXES, CLOUDINESS, AND OTHER PHYSICAL PARAMETERS ON A SIMULATED MONSOON SYSTEM Ph.D. Thesis
Lie-Shieu Fang 1985 292 p
Avail: Univ. Microfilms Order No. DA8520106

Many general circulation modelers have identified the key factors influencing the Indian southwest monsoon. The Webster and Chou model was employed to diagnose important monsoon events or disturbances such as the shock, onset vortex, organized precipitation cells, etc., and to resolve the near equatorial disturbances that develop on the Southern Equatorial Trough (SET). A two degree resolution instead of the original four degree solution was adopted. A noteworthy result of the High Resolution (HR) experiment is the generation of a shock signalling the onset of monsoon. The results of surface winds (CS) case show a weakening of the shock but a stronger development of westerlies at 750 mb. The precipitation in association with the onset in CS is less compared to HR but is prolonged. Climatologically derived albedos (CA) experiment experiment affected the timing of the monsoon onset, reduced the intensity of the shock and developed less rainfall than HR. A combination of the CS and CA experiments eliminated the shock, advanced the monsoon onset and increased the rainfall over the land area. It is demonstrated that SET can influence the monsoon activity by decreasing rainfall particularly north of 25 deg N. This means that SET can initiate break conditions over northern India. The land-sea boundary experiments show that the timing of the monsoon onset is dependent on the land-sea distribution while the vigor is dependent on the air-sea exchange.
Dissert. Abstr.

N86-21012 Deutscher Wetterdienst, Offenbach am Main (West Germany).
ANNALS OF METEOROLOGY, NO. 22. INTERNATIONAL SYMPOSIUM ON HUMAN BIOMETEOROLOGY [ANNALEN DER METEOROLOGIE (NEUE FOLGE). NR. 22: INTERNATIONALE TAGUNG FUER HUMAN-BIOMETEOROLOGIE]
13 Aug. 1985 150 p refs In ENGLISH and GERMAN Symposium held in Freiburg, West Germany, 2-4 Oct. 1985
(ISBN-3-88148-229-9; ISSN-0072-4122) Copyright. Avail: Issuing Activity

Neurophysiology, receptor physiology, thermophysiology using epidemiological methodology; air hygiene; applications to city and regional planning; and boundary layer meteorology are discussed. For individual titles, see N86-21013 through N86-21067.

N86-21013 Dortmund Univ. (West Germany). Inst. fuer Arbeitsphysiologie.
NEUROPHYSIOLOGICAL ACTIVITY AND PSYCHOPHYSICAL EFFECTIVENESS OF ENVIRONMENTAL FACTORS [NEUROPHYSIOLOGISCHE VERARBEITUNG UND PSYCHOPHYSISCHE WIRKSAMKEIT VON UMWELTEINFLUESSEN] **c52**
Walter H. Ehrenstein *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 1-5 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

The sensorial transmission of the body/environment relationship is presented as well as the correlation between subjective and objective data through sensorial organs. The

correlation investigation method is successfully applied to vision investigation to study the neurophysiological activity and psychophysical effectiveness of environmental factors. Further application of the psychophysiological concepts and methods presented is recommended for medical meteorological research. The investigation of qualitative relationships using impression scales is recommended to determine the central processes in the psychological assessment of the environmental factors. Author (ESA)

N86-21014 Max-Planck-Inst. fuer Physiologische und Klinische Forschung, Bad Nauheim (West Germany).
THE INTERFACE BETWEEN ATMOSPHERE AND ORGANISM c52

Friedrich-Karl Pierau *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 6-8 refs (For primary document see N86-21012 11-47)
Avail: Issuing Activity

The effects of temperature, air currents, and humidity on the human body and the stimulation of skin receptors are studied. The somatosensory processes underlying the communication between man and his environment and the relay of sensory information into the central nervous system are discussed. The transformation of temperature and mechanical signals into bioelectric signals (generation of a depolarizing nonpropagated receptor potential), the encoding of the stimulus features and the principles of processing in the central nervous system are reviewed. Mechanisms to detect air humidity by nasal and/or hypothalamic temperature receptors (slowly adapting and rapidly adapting mechanoreceptors) are discussed. The high sensitivity (transient and proportional) of temperature receptors is used to sense changes in air humidity. Sudden increase of nasal temperature may contribute to sensation of humidity. Author (ESA)

N86-21015 Karlsruhe Univ. (West Germany). Inst. fuer Meteorologie und Klimaforschung.
DETERMINATION OF THE THERMAL ENVIRONMENTAL CONDITION FLUCTUATIONS IN MAN USING MEASURING TECHNIQUES [MESSTECHNISCHE ERFASSUNG VON FLUKTUATIONEN DER THERMISCHEN UMGEBUNGSBEDINGUNGEN DES MENSCHEN]
Olaf Kolle and Karl Hoeschele *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 9-11 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

Fluctuations of the thermal action magnitude are studied to determine the differences in stimuli of the thermal environmental conditions on microturbulent variation spectra under different weather conditions and location data. Investigations in high and low pressure weather conditions, in cold and warm fronts, under various stratification stabilities were peformed. Measurement under comparable weather conditions were performed using a mobile device in city center, in an urban area with scattered housing, in a woods, and indoors. The radiation temperature was measured with a radiation measuring instrument to determine the radiation field strength and distribution. Measurements show good agreement with theoretical results. Author (ESA)

N86-21016 Dortmund Univ. (West Germany). Inst. fuer Arbeitsphysiologie.
MAN'S THERMAL BUDGET UNDER VARIOUS CLIMATES [WAERMBEBILANZ DES MENSCHEN IN VERSCHIEDENEN KLIMATEN] c52

Hans Gerd Wenzel *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 12-16 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

Facts on man's thermoregulation system, conditioning, clothing and food requirements, on heat transfer through blood and skin, and metabolism are presented. Physiological processes of autonomous thermoregulation are described. Boundary conditions based on rectal temperature variations under heavy climates are studied to determine man's tolerance to heat stroke and heat stress (sensations of uneasiness, drop in corporal and psychological efficiency, specific health troubles). Author (ESA)

N86-21017 Technische Univ., Munich (West Germany). Lehrstuhl fuer Bioklimatologie und Angewandte Meteorologie.
APPLICATION OF A NONSTATIONARY ENERGY BUDGET MODEL TO DETERMINE THERMAL COMFORT [ANWENDUNGSMOEGLICHKEITEN EINES INSTATIONAEREN ENERGIEBILANZMODELLS ZUR BEWERTUNG DER THERMISCHEN BEHAGLICHKEIT] c52

Peter Hoeppe *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 17-18 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

A nonstationary energy budget model based on the fundamental energy flux equations is applied to determine heat stress and heat storage under variable environmental conditions. Temperature variations in the body core and shell are calculated. A man walking on a 200 m long sunlit street section at a speed of 0.4 m/sec dressed in light summer clothing is exposed to 3 min direct sun radiation and street surface radiation. No sultriness is noted with the nonstationary model. Nonstationary energy budget models can be applied for cold and warm therapy since they can give information on the optimal exposure times to reach a given thermal body condition. Author (ESA)

N86-21018 Fraunhofer-Inst. fuer Bauphysik, Stuttgart (West Germany). Institutsbereich Waerme/Klima.
PHYSICAL CAUSES OF AIR DRAFT PHENOMENA, NEW FACTS [PHYSIKALISCHE URSACHEN FUER ZUGERSCHEINUNGEN - NEUE ERKENNTNISSE] c52

Erhard Mayer *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 19-20 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

The physical causes of air draught phenomena causing health troubles are analyzed (especially man's local convective cooling resulting in a surface temperature decrease) as well as the relationship between convective heat transfer factor and thermal comfort. Measurements of convection on a heated artificial head show a parabolic correlation between self-convection and the product of air velocity mean value with turbulence degree and convective heat transfer factor. The area under the hyperboles corresponds to thermal comfort. Measurements were performed in buildings with and without air conditioning. Experimental results show good agreement with inquiry results. More cases of air draft troubles are recorded in buildings with air conditioning than in buildings without air conditioning. Convective heat transfer factor is better adapted to thermal comfort evaluation than air velocity mean value. Author (ESA)

N86-21019 Technische Univ., Munich (West Germany). Inst. fuer Medizinische Balneologie und Klimatologie.
CLIMATIC CURE ON A PRACTICAL LEVEL [KLIMATUR IN DER PRAXIS] c52

Angela Schuh *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 21-22 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

About 150 patients were submitted to cardiovascular training and thermoregulatory training during their cure period to improve their response to climatic stimuli by applying ambulatory therapy. Pulse and blood pressure were measured to determine the physiological reaction and eye stress under climatic conditions. Patients were taught the thermoregulation system so as to react economically to climatic conditions. They were interrogated on their thermal comfort during the walk. Lactate formation and rewarming time were measured. Improved response to cold stimuli

can be achieved with the application of this form of climatic cure combining cardiopulmonar training and thermoregulatory training.
Author (ESA)

N86-21020 Meteorologischer Dienst der DDR, Berlin (East Germany). Forschungsinst. fuer Bioklimatologie.
ON THE IMPORTANCE OF COOLING IN CLIMATIC THERAPY [ZUR BEDEUTUNG DER ABKUEHLUNG IM RAHMEN DER KLIMATHERAPIE] c52
L. Klinker and E. Turowski *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 23-24 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

The effects of meteorological cold stimuli under constant social environment before, during, and after a cold air resting cure with whole body stress are analyzed. Resistance and vegetative transposition are reflected by an increase in the resting time for a cooling value of 188 kJ/sq m and by an increased excretion of creatinine and of a substitute product of adrenalin and noradrenalin. Increased blood pressure in cold pressure test, blood pressure fall to 5 to 15 mm, pulse frequency drop to 1.5 per min. and a drop in flicker fusion frequency and in the pupillary aperture are recorded during the acclimatization period. A better use of oxygen is observed during cooling therapy. Dosage recommendations for the different groups of patients according to their sensitivity to cold conditions are given. Author (ESA)

N86-21021 National Inst. for Rheumatics and Physiotherapy, Budapest (Hungary).
THE INFLUENCE OF HELIOMETEOROLOGIC FACTORS ON CIRCULATION AND SOME VEGETATIVE FUNCTIONS c52
Imre Oermenyi *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 25-26 (For primary document see N86-21012 11-47)
Avail: Issuing Activity

Solar effects on circulation and vegetative functions were studied based on daily measurements of the systolic and diastolic blood pressure (SBP and DBP), and the arterial pulse number (APN) of 112 patients and 11 control individuals leading to a vegetative Index (VI). If VI is positive, sympathetic reactions increase; if VI is negative, parasympathetic reactions increase. Weather data and chromospheric flares are taken into account. The SBP and DBP increase during cold front passage, upper or lower, and during anticyclonic weather formation. The APN increases in presence of higher troposphere subtropical air. Tropospheric coding and continental cold air cause increased parasympathetic reactions. The latter increase in accordance with the direction of weather and geoactive solar activity. Sympathetic-like reactions appear with increased solar radio noise level around 200 MHz and 19 Ghz. The results of the study are used in forecasting physiological effects for public health. Author (ESA)

N86-21022 Institute of Meteorology and Water Management, Podlesna (Poland). Dept. of Climatology.
METEOROTROPIC DETERMINANTS OF ROAD COLLISIONS AND ACCIDENTS c52
Maria Baranowska and Barbara Gabryl-Wojtach *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 27-28 ref (For primary document see N86-21012 11-47)
Avail: Issuing Activity

The effects of traffic intensity fluctuations and rainfall and fog on human psychophysical performance are studied based on statistics of daily number of road collisions and accidents (Lkw) over a period of 8 yr. Correlation is found between Lkw and rainfall but not between Lkw and duration of fog. The relationship between Lkw and basic systems and atmospheric fronts as well as the influence of extreme environmental changes are investigated. A significant increase of accidents is noted during strong front passages. A correlation is noted between Lkw statistics and cyclonal processes and extreme environmental changes, whatever the seasonal rhythm. Author (ESA)

N86-21023 Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria). Neurochirurgische Ambulanz am Ambulatorium. Sued.
OBJECTIVE INVESTIGATIONS AND SUBJECTIVE OBSERVATIONS OF SENSITIVITY TO WEATHER [OBJEKTIVE UNTERSUCHUNGEN UND SUBJEKTIVE BEOBACHTUNGEN UEBER WETTERFUEHLIGKEIT] c52
Fritz J. Jenkner *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 29-30 In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

The following criteria were investigated in 4,000 patients (women: 68%, men: 32%); sex, sensitivity to weather, light or painful troubles, shorter or longer period, with normal or increased blood, sedimentation rate, vertigo, headaches, lymphocyte count, pherogram, lymphocytosis. Women are more sensitive to weather changes than men with a higher frequency and increased blood sedimentation rate. Sensitive patients with a frequency of 75% for women and 25% for men have more painful troubles, a longer anamnesis period, more migraine and vertigo and a delay of the ovalbumin fraction. In insensitive patients the frequency is 62% for women and 38% for men. Further investigations are recommended to elicit the reasons of the statistically based differences. Author (ESA)

N86-21024 Hydrometeorological Inst. of the Socialist Republic of Croatia, Zagreb (Yugoslavia).
COLLOIDAL AND METEOROLOGICAL IN VITRO REACTIONS c52
Nada Plesko *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 31-32 refs (For primary document see N86-21012 11-47)
Avail: Issuing Activity

A reaction measuring system was developed to determine the effects of differential mean mole weight colloids, and to investigate the state variations of colloidal systems in correlation with solar-terrestrial phenomena. The relationships between solar terrestrial phenomena and the measurement variations, and between the measurement variations and weather sensitivity in healthy and ill people are investigated. The measured data corrected by the two relationships can then be applied for prevention in medicine, transport, and industry. The closed measuring system is insensitive to vibrations, gravity, and temperature stable when stored, and automatically performs the measurement of large molecular polyvinylpyrrolidon (PVP) in solutions with few electrolytes. The pseudopolarization effects depend on the adsorption layer thickness due to the degree of association of dissolved PUP molecules and to solar terrestrial factors.
Author (ESA)

N86-21025 Universitaetsspital, Zurich (Switzerland). Biologisches Zentrallaboratorium.
WEATHER SENSITIVITY AS DISCOMFORT [DIE WETTERFUEHLIGKEIT ALS DISKOMFORT] c52
Wolf H. Weihe *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 35-37 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

Weather sensitivity due to a thermal imbalance between environment and organism leads to uneasiness or discomfort. Subjective and cognitive processes trigger the behavorial temperature regulation in order to sustain the autonomous physiological regulation. The behavorial temperature regulation can influence healing or aggravate the discomfort condition. Ill behavorial attitudes (unadapted dressing, inactivity, unbalanced eating and drinking, environment changes, etc.) are modified with training, decisiveness, will power, self-confidence and education. Weather

sensitivity appears when individuals cannot perceive the relationship between thermal load error and temperature preferred conditions. Pharmacotherapy is recommended for special cases only. Further investigation of weather sensitivity is recommended to check the identity between sensitivity and thermal discomfort under natural weather changes. Individuals should be taught temperature balance. Author (ESA)

N86-21026 Deutscher Wetterdienst, Freiburg (West Germany). Zentrale Medizin-Meteorologische Forschungsstelle.
WEATHER AS A PHYSICAL PROCESS AND PARAMETERIZATION OF THE EFFECTS AS A METEOROLOGICAL CONTRIBUTION FOR INVESTIGATING THE CORRELATION BETWEEN WEATHER AND MAN [DAS WETTER ALS PHYSIKALISCHE PROZESS UND SEINE WIRKUNGSRELEVANTE PARAMETRISIERUNG ALS METEOROLOGISCHER BEITRAG ZUR UNTERSUCHUNG DER BEZIEHUNG WETTER - MENSCH] c52
Klaus Bucher *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 38-41 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

Use of meteorological parameters as causal parameters for medical research on thermoregulatory troubles due to atmospheric processes is discussed. They can be used for characterization of specific atmospheric processes. An objective classification of meteorological parameters is based on biotropy influenced by weather change intensity and pressure areas and on the characterization of the transition areas between systems with differential air pressure. Air temperature and humidity changes are investigated for quantification of the description of meteorological processes. The change of the atmospheric dynamic relations determined by statistical investigations based on factor analysis influences the meteorological parameters measured near the ground.
Author (ESA)

N86-21027 Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria). Ambulatorium Sued.
WEATHER AND MIGRAINE [WETTER UND MIGRAENE] c52
Fritz L. Jenkner and Alois Machalek *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 43-44 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

The relationship between headache intensity and weather situations is investigated statistically based on forms filled in by 80 ambulent patients suffering from migraine from April to September 1982. The correlations are determined using univariant methods (correlation and regression analysis) and parameter-free methods (Chi-squared test and U-test) with respect to high pressure and low pressure weather situations, even pressure distribution, variable weather, and southern circulation form. Almost 60% of the patients are sensitive to weather. Less cases of high intensity headaches occur under low pressure weather conditions than under anticyclonal and zonal circulation weather situations. More serious headaches occur under atmospheric subsidence. No reliable statistical results can be obtained due to the medical data inhomogeneity. Improved terminology of bioweather situations should give more accurate data on the relationship between headache intensity and frequency and weather. Author (ESA)

N86-21028 Hydrometeorological Inst. of the Socialist Republic of Croatia, Zagreb (Yugoslavia).
TEMPERATURE WIND SPEED HUMIDITY (TWH): A BIOMETEOROLOGICAL INDEX TESTING c52
Ksenija Zaninovic *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 45-46 refs (For primary document see N86-21012 11-47)
Avail: Issuing Activity

The temperature, wind velocity, humidity index (TWH) based on measured values of temperature, wind speed and air humidity, on Hill's equations for cooling power, and on Brazol's sensation scale is tested for extreme temperature conditions to assess thermal sensation and its applicability in bioclimate evaluation. The TWH was compared with air enthalpy average values of a 10-day period during 10 yr. The TWH index including wind cooling effects gives better results than air enthalpy. It reinforces the sensation of cold in winter and smoothes the sensation of warmth in summer mornings and evenings. Author (ESA)

N86-21029 Jugenddorf Christophorusschule, Berchtesgaden (West Germany). Asthmatherapiezentrum.
WEATHER AND ASTHMA SYMPTOMS [WETTER UND ASTHMASYMPTOMATIK] c52
J. Lecheler and M. Voelker *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 47-48 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

The influence of weather-dependent environmental factors outside the laboratory on asthma was investigated based on the observation of 46 heavily asthmatic children and teenagers undergoing a long therapy at 1200 m. Peak-flow forms are filled in indicating their lung function every morning and evening. The values are compared with those of the weather station with respect to temperature, air humidity, sunshine, rainfall amount in mm, and atmospheric pressure. Correlation is noted between peak flow measured lung function values and monthly average temperatures and average insolation time. A relationship between temperature collapses and lung function worsening is noted. During the first months of summer the influence of the weather-dependent factors is added to the allergy stress. A 2 yr. observation time is recommended to obtain more accurate results. Author (ESA)

N86-21030 Central Meteorological Service, Peking (China).
STUDY OF A METEOROLOGICAL PREDICTION OF ACUTE MYOCARDIAL INFARCTION INCIDENCE c52
Yianwen Wang and Xuecui Zhang (Lianyungang Ocean Station, China) *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 49-50 refs (For primary document see N86-21012 11-47)
Avail: Issuing Activity

The relationship between acute myocardial infarction incidence and weather in Beijing area is investigated. Excitation weather event and mitigating weather situation effects are analyzed to draw prediction model charts for infarction incidence. The whole-year synoptic situation is split into 65.5% for mitigating weather situation and 34.5% for excitation weather events. The disease occurrence is associated with cold front passage, low temperature, and high wind situations. Severe cold air before the front edge of cold high situation without any cold front passage is sufficient to affect a patient. Association of excitation weather event and precipitation eliminates the harmful effect. Further study of the disease inducement effects of excitation weather events is recommended. Author (ESA)

N86-21031 Forschunginstitut fuer Balneologie, Marianske Lazne (Czechoslovakia).
METEOROTROPIC CHANGES OF CARDIAC PATIENTS' BLOOD PRESSURE AND PULSE FREQUENCY DURING A COMPLEX BATH CURE [METEOROTROPE VERAENDERUNGEN DES BLUTZUCKERS UND DER PULSFREQUENZ DER HERZKRANKEN IM VERLAUF DER KOMPLEXEN BAEDERKUR] c52
Vit Kveton, Jiri Matousek, and Zdenek Sebesta *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 51-52 In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

Air temperature, air humidity, and barometric pressure effects on cardiac patients' blood pressure (systolic and diastolic) and pulse frequency were investigated during a complex bath cure using multidimensional linear regression analysis. The cure includes climatotherapy, diet, balneological and physical therapy, kinesetherapy, group training, and cycling. The barometric pressure influences the systolic and diastolic blood pressure. Daily

temperature magnitude and passage from anticyclonal to zonal weather influence the pulse frequency. The synoptic coupling of biotropic efficient meteorological factors is assessed to deduce synoptic weather situations influencing the patients' blood pressure and pulse frequency. Author (ESA)

N86-21032 Forschunginstitut fuer Balneologie, Marianske Lazne (Czechoslovakia).
WEATHER AND SUBJECTIVE HEALTH COMPLICATIONS IN CARDIAC PATIENTS [DAS WETTER UND DIE SUBJEKTIVEN GESUNDHEITSSCHWIERIGKEITEN DER HERZKRANKEN] c52
Vit Kveton *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 53-54 In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

The relationship between daily occurrence of complications in cardiac patients and the atmospheric environment (air pressure, air humidity, wind velocity, temperature) is analyzed based on data of 2 yr observation of patients suffering from myocardial infarction. Stress of the thermoregulatory system as well as ground meteorological elements increase the biological reaction. The deviation of the relative daily occurrence is determined for chest troubles and respiratory distress at rest and during walking, for heart beat, and exhaustion and fear situations with respect to sunshine, jog, rain, and bad weather conditions. Author (ESA)

N86-21033 Deutscher Wetterdienst, Offenbach am Main (West Germany).
INVESTIGATIONS OF THE POSSIBLE INFLUENCE OF AIR ELECTRICAL PHENOMENA ON DULLING AND GHOST ACHING IN AMPUTATED PATIENTS [UNTERSUCHUNGEN UEBER EINEN MOEGLICHEN EINFLUSS VON LUFTELEKTRISCHEN ERSCHEINUNGEN AUF STUMPF- UND PHANTOMSCHMERZEN BEI AMPUTIERTEN] c52
J. Pelz (Freie Univ., Berlin, West Germany) and H. J. Swantes *In its* Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 55-56 ref In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

The effects of air electricity on dulling and ghost aching in amputated patients are investigated based on written patients' complaints, weather observations in weather stations, and on automatic measurement of the atmospheric impulse radiation. Ghost aching geographical distribution is shown statistically. Ghost aching occurrence increases parallel to increased impulse radiation. Dulling troubles have a similar distribution as the occurrence distribution. The occurrence geographical distribution of aching complaints per month and per patient from 1976 to 1979 is investigated, leading to a mapping of the complaint locations. The correlation between bad weather occurrence and aching occurrence cannot be made. The same mapping can be made for dulling troubles. Author (ESA)

N86-21034 Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria).
THE AUSTRIAN BIOMETEOROLOGICAL SERVICE [DER OESTERREICHISCHE BIOWETTERDIENST] c52
Alois Machalek and Peter Sabo *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 57-58 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

The bioweather research project to analyze the effects of weather on healthy and sick persons is described. The investigation is based on high pressure weather; even pressure distribution; low pressure situation; western and north-western weather situation; southern and South-Western weather situation as well as on cold air incursions in ground and medium layers of the atmosphere and on atmospheric depression. Application of Bioweather requires the partition of Austria in bioweather areas according to bioclimatic conditions. Author (ESA)

N86-21035 Kommunalverband Ruhrgebiet, Essen (West Germany).
VERTICAL EXCHANGE AND POLLUTION CONCENTRATIONS IN CONURBATIONS, FOR EXAMPLE, DORTMUND (WEST GERMANY) [VERTIKALAUSTAUSCH UND SCHADSTOFFKONZENTRATIONEN UEBER BALLUNGSRAEUMEN AM BEISPIEL DER STADT DORTMUND]
Wolfgang Beckroege *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 60-62 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

A city climate analysis was performed to investigate exchange conditions and pollution concentrations in a city. A 24 hr measurement was performed under light wind high pressure conditions. Atmospheric stability at stations in city surroundings, transition area between city/city surroundings, and city center was measured. The energy required for labeling can be calculated using a simple numerical simulation model based on mixing layer height over the city area and on the temperature gradients of the inversion layer. The highest vertical wind velocity is measured in the city center at night fall and at higher levels than the city neigborhood using radar. Leading tracks corresponding to wind steady direction over areas with reduced roughness over long distances can increase or reduce the mixing condition according to the situation and to the wind direction. Author (ESA)

N86-21036 Jugenddorf Christophorusschule, Berchtesgaden (West Germany). Asthmatherapiezentrum.
HEIGHT-DEPENDENT REDUCTION OF AIRBORNE POLLEN AND EFFECTS ON CHILDREN AND TEENAGERS AFFECTED BY BRONCHIAL ASTHMA [HOEHENABHAENGIGIGE REDUZIERUNG DES POLLENFLUGS UND DIE AUSWIRKUNG AUF KINDER UND JUGENDLICHE MIT ASTHMA BRONCHIALE] c52
J. Lecheler, M. Voelker, and R. Winkler *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 63-64 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

Forty asthmatic children and adolescents with seasonal sensitization and rhinoconjunctivitis were monitored and their symptomatology compared during the pollinosis season. The comparison shows a significant reduction of the bronchial symptomatology as well as of the allergic rhinoconjunctivitis due to a reduced allergen influx resulting from reduced airborne pollen in high mountains. Disappearance of the perennial allergens, better monitoring, and therapy optimization account for bronchial improvement. The seasonal allergen effects are reduced by height-dependent reduced airborne pollen. Author (ESA)

N86-21037 Rheinisch Westfaelische Technischer Ueberwachungs-Verein e.V., Essen (West Germany).
MESUREMENTS OF CARBON MONOXIDE EMISSIONS FOR DETERMINATION OF THE CONCENTRATION DIFFERENCES BETWEEN OPEN AIR AND INDOOR AIR VALUES [MESSUNGEN VON KOHLENWASSERSTOFFIMMISSIONEN ZUR ERMITTLUNG VON KONZENTRATIONSUNTERSCHIEDEN ZWISCHEN FREI-LAND- UND RAUMLUFTWERTEN] c45
Juergen Frank *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposiumn Human Biometeorology 13 Aug. 1985 p 65-66 In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

Measurements of benzol, toluol, xylol, ethylbenzol and dicyclopentadiene in a urban area next to a big city were performed from summer 1984 to fall 1984 and completed in April 1985 by measurements in a reference area to determine carbon monoxide emissions. Measurements were performed in the open air (85%) and indoors (15%). Air and ground temperature, and wind direction and velocity were measured. The measured pollution concentrations are assessed with respect to load and hazard effects. The limit values for each material (maximum immission concentrations and maximum activity concentrations) are far

exceeded. The concentration level in houses is higher than in the open air. Thus, emission of the selected materials comes from houses. The differences between the test and the reference area cannot be explained. Author (ESA)

N86-21038 Duesseldorf Univ. (West Germany). Medizinisches Inst. fuer Umwelthygiene.
EFFECTS OF AIR POLLUTION ON MAN [WIRKUNG VON LUFTVERUNREINIGUNGEN AUF DEN MENSCHEN] c52
H.-W. Schlipkoeter and K. Beyen *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 67-69 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

Air pollution and airway diseases; effects of carbon monoxide on healthy and cardiac people; effects of smog on old people affected by serious airway and blood circulation diseases and effects of heavy dust; heavy metal effects of babies, and young children (neurophysiological troubles); effects of cadmium on old people's renal function; and air pollution and lung cancer due to polycyclic aromatic carbon monoxides are discussed.Author (ESA)

N86-21039 Giessen Univ. (West Germany). Hygiene-Inst.
GROUP DIAGNOSIS AS RISK ASSESSMENT IN ENVIRONMENT HYGIENE [GRUPPENDIAGNOSTIK ALS RISIKOABSCHAETZUNG IN DER UMWELTHYGIENE] c52
Pavel Schmidt and Ernst Gerhard Beck *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 70-71 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

Group diagnosis based on clinical epidemiology, laboratory investigation, and anthropological and statistical methods is performed for risk assessment and to determine the correlation between health, development maturity, living habits and environment pollution. An epidemiological investigation on a group of clinically healthy 10 yr old children over 5 yr shows that children in an urban air-polluted area have more enlarged lymphatic nodes, fewer red blood cells and hemoglobin, fewer antibodies, and are more sensitive to stress than children in relatively pure air areas. Author (ESA)

N86-21040 Freie Univ., Berlin (West Germany). Rittberg-Kinderklinik.
IMMISSION AND WEATHER EFFECTS ON CHILDREN'S AIRWAY ILLNESSES IN BERLIN (1979-1982): METHODOLOGY AND RESULT SUMMARY [IMMISSIONS- UND WETTEREINFLUESSE AUF ATEMWEGSERKRANKUNGEN VON KINDERN IN BERLIN (1979-1982). METHODIK UND ERGEBNISUEBERBLICK] c52
Ulrich Fegeler, Roman Moyzes, Erich Wedler, and Kurt Eberhard *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 72-74 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

The possible acute effects of inhalative air pollution and of meteorological environmental factors on the morbidity rate of children's upper and lower airway illnesses listed in four diagnosis groups (pseudo Croup, bronchitis-pneumonia, asthma, and influenza) are reviewed with respect to immission parameters. Independent variables (SO2 concentration, equivalent temperature, interdiurnal air pressure, and relative indoor humidity) are linearly correlated with morbidity rate in monthly, weekly, and daily mean values. Air pollution immission and meteorological parameters influence the course of the infection rate of upper and lower airway illnesses. They have hazardous effects on the respiratory tissue separately or combined. Assumptions on the influence on infection rates of air chemical and thermal complex are given for Croup syndrome and asthma. Author (ESA)

N86-21041 Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria).
ENVIRONMENTAL FACTORS AND INFANT MORTALITY [UMWELTFAKTOREN UND SAEUGLINGSSTERBLICHKEIT] c52
Alois Machalek, Helene Kapaun, and Ermar Junker *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 75-76 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

The Sudden Infant Death Syndrome (SIDS) was studied with respect to air chemistry. Hexachlorobenzol, nitrates in water, and acid rain cause SIDS. The effects of air substances are reviewed. The relationship between airway illnesses and air substances is statistically established for Croup syndrome. No seasonal influence is noted for SIDS. Two correlations are shown (but not statistically): appearance of SIDS culminations during the hot period after biospheric high pollution load and on days with temperature extremes in summer or in winter. Author (ESA)

N86-21042 Gesamthochschule, Kassel (West Germany).
AIRWAY INFECTIONS RELATED TO CITY CLIMATE AND LOCAL IMMISSION LOAD [ATEMWEGSERKRANKUNGEN IN ABHAENGIGKEIT VON STADTKLIMA UND LOKALER IMMISSIONSBELASTUNG] c52
Lutz Katzschner *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 77-79 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

The effects of immission load on infants up to 6 yr old are investigated in relation to climate, airway infections, and SO2 concentration. Air temperature significantly influences the onset of illnesses. Immission data are not sufficient to explain stress situations. Air polluting substances influence the immune system leading to body weakening and to an increased sensitization to viral agents. Author (ESA)

N86-21043 Technische Univ., Munich (West Germany). Inst. fuer Medizinische Balneologie und Klimatologie.
WHAT IN HUMAN BIOMETEOROLOGY CAN CONTRIBUTE TO ASSESSMENT OF THE EFFECTS OF HAZARDOUS SUBSTANCES ON HEALTH? [WAS KANN DIE HUMANBIOMETEOROLOGIE ZUR BEWERTUNG GESUNDHEITLICHER WIRKUNGEN VON SCHADSTOFFEN BEITRAGEN] c52
Karl Dirnagl *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 80-81 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

Anthropogenic atmospheric influence factors; relativism in the assessment of the quantification of the hazardous effects on health and limit values; a political assessment of quantitative data; and disproportion between measurement and monitoring programs and investigations of the hazardous effects are discussed. Quantitative assessment should be avoided. The popularity gained by scientific results on weather effects on man's health should be used to avoid an erroneous vision of assessment of environmental effects. Author (ESA)

N86-21044 Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.
IMMISSION AND WEATHER EFFECTS ON CHILDREN'S AIRWAY TROUBLES IN BERLIN (1979-1982). TIME SERIES INVESTIGATIONS: CROUP SYNDROME AND ASTHMATIC AIRWAY TROUBLES [IMMISSIONS- UND WETTEREINFLUESSE AUF ATEMWEGSERKRANKUNGEN VON KINDERN IN BERLIN (1979-1982) ZEITREIHENUNTERSUCHUNGEN: CROUPSYNDROM UND ASTHMATISCHE ATEMWEGSERKRANKUNGEN] c52
Ulrich Fegeler, Roman Moyzes, Erich Wedler, and Kurt Eberhard *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 82-85 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

Croup syndrome and asthma airway troubles in children aged

0 to 6 yr divided into 3 age groups were clinically investigated to determine the effects of immission and weather conditions on the infection percentage according to annual, interannual, and weekly variations, and SO2 concentration periods and days. Croup affection percentage increases from summer to fall, during the cold period due to an increased immission. Linear correlations are made between SO2 concentration, indoor humidity, and infection percentage. Maximum occurrence of asthma affections is in winter and from May to July due to pollen allergens. A positive correlation is made between asthma and SO2 concentration, a negative one between asthma and indoor humidity. The injection epidemiological effect (mycoplasma pneumoniae) is excluded for Croup syndrom. It is taken into account for asthma. Author (ESA)

N86-21045 Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.
EMISSION AND WEATHER EFFECTS ON CHILDREN'S AIRWAY TROUBLES IN BERLIN (1979-1982). COMPARISON OF TWO DIFFERENT EMISSIONS: LOADED RESIDENTIAL AREAS IN WEST BERLIN POLLUTED AREAS [IMMISSIONS- UND WETTERFLUESSE AUF ATEMWEGSERKRANKUNGEN VON KINDERN IN BERLIN (1979-1982). VERGLEICH ZWEIER UNTERSCHIEDLICH IMMISSIONSBELASTETER WOHNBEREICHE IM BELASTUNGSGEBIET BERLIN (WEST)] c52
Ulrich Fegeler, Roman Moyzes, Erich Wedler, and Kurt Eberhard *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 86-87 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

Two SO2 emission-loaded residential areas are compared based on affection ratios of children suffering from Croup syndrome and asthma in the two investigation hospitals. More children suffer from asthmatic troubles in a polluted area with SO2 emission over the average than the one with SO2 emission below the average. More children suffer from Croup syndrome in a polluted area with SO2 emission below the average than in the one with SO2 emission over the average. Author (ESA)

N86-21046 Technische Univ., Munich (West Germany). Inst. fuer Medizinische Balneologie.
AIR QUALITY DETERMINATION IN HEALTH RESORTS [LUFTQUALITAETSBESTIMMUNG IN KURORTEN] c52
Angela Schuh *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 88-89 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

The medium pollution and short-time peak concentration of SO2, CO and other gaseous air constituents were measured to assess air quality in health resorts. The spatial distribution and air constituent content were assessed in weekly analyses of Petri dish sulfur and nitrogen oxide content. The filter was exposed to heavy air pollution to test the measuring procedure. Comparison with the previous concentration measurements shows good agreement with the filter measurements. Author (ESA)

N86-21047 Deutscher Wetterdienst, Freiburg (West Germany). Zentrale Medizinmeteorologische Forschungsstelle.
THE BIOLOGICAL EFFICIENCY OF DUST EMISSION: DETERMINATION BASED ON THE WITHERING DEGREE OF EXPLOSED LICHENS [DIE BIOLOGISCHE WIRKSAMKEIT VON STAUBIMMISSIONEN: ERMITTELT ANHAND DES ABSTERBEGRADES EXPONIERTER FLECHTEN] c52
R. Rabe and E. Schultz *In its* Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 90-91 In GERMAN Prepared in cooperation with Rheinische Westfaelische Technischer Ueberwachungs-Verein e.V., Essen, West Germany (For primary document see N86-21012 11-47)
Avail: Issuing Activity

Air hygiene and air quality in cities and health resorts were determined using the method of lichen exposition to dust emission based on the relationship between lichen withering degree and emission constituent efficiency and their effects on health. Results show good agreement between lichen withering degree and mortality or morbidity. The results are confirmed by epidemiological investigations based on dust foil measurement. A correlation between soot deposition and lichen withering degree is noted. The quantity deposition ratio for particle combustion products allows assessment of air quality in health resorts using the adherence foil method. Author (ESA)

N86-21048 Basel Univ. (Switzerland).
A SIMPLE PROCEDURE FOR SEMI-QUANTITATIVE DETERMINATION OF DUST IN AIR [EINE EINFACHE, WENIG AUFWENDIGE METHODE ZUR HALBQUANTITATIVEN BESTIMMUNG VON STAUB IN DER LUFT] c45
Gundo Boehm *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 92-94 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

Dust in the air was determined using the Burkard pollen and spore trap fixture. The particles are retained on an adhesive foil and immersed in a polyvinylalcohol. The preparations are analyzed quantitatively and qualitatively based on microscopic study of dust, soot, and dust particle strips. Densitometers and a pherogram are used to study the strips semi-quantitatively. Author (ESA)

N86-21049 Deutscher Wetterdienst, Offenbach am Main (West Germany).
PROBLEMS OF CITY PLANNING [PROBLEME DER STADTPLANUNG] c52
Bob Frommes *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 95-98 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

The limits of meteorology for city planning; purpose of city and building climatology; architects' and planners' expectations regarding meteorology; and relevance of the meteorological information in planners decision making are discussed. Interactions between climate, buildings and city; and inhabitants' protection against bad weather and health troubles are considered. Author (ESA)

N86-21050 Technische Univ., Munich (West Germany). Lehrstuhl fuer Bioklimatologie und Angewandte Meteorologie.
PROBLEMS IN CITY CLIMATE EVALUATION IN HUMAN BIOMETEOROLOGICAL TERMS [PROBLEMATIK BEI DER HUMANBIOMETEOROLOGISCHE BEWERTUNG DES STADTKLIMAS] c52
Helmut Mayer *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 99-100 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

The city climate is split into air hygiene (city air quality) and thermal components (city air energy) for relevant assessment of the city climate in human biometeorological terms for decision making in city planning. The relations between hazardous substances in the city causing health troubles in man should be further investigated with respect to inner city differentiations (city elements, constructions, entire city districts). Relevant meteorological data include the height of man's center of gravity and spatial radiation field. Author (ESA)

N86-21051 Deutscher Wetterdienst, Freiburg (West Germany). Zentrale Medizinmeteorologische Forschungsstelle.
NUMERICAL SIMULATION OF THE METEOROLOGICAL CONDITIONS OF MAN'S HEAT LOSS IN NARROW ALLEYS [NUMERISCHE SIMULATION DER METEOROLOGISCHEN BEDINGUNGEN DER WAERMEABGABE DES MENSCHEN IN STRASSENSCHLUCHTEN]
U. Sievers (Mainz Univ., West Germany) and G. Jendritzky *In its*

Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 101-103 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

Climate models were used to investigate the effects of city construction variables on city planning. The models allow the evaluation of the planned city construction activity effects on the microscale meteorological conditions. The calculations show the technical but not economic feasibility of the microscale numerical simulation. The reproducibility of the results on two-dimensional models should be verified with a three dimensional problem. Measures in narrow alleys and inner yards should be done to check and improve the simulation model. Author (ESA)

N86-21052 Kaiserslautern Univ. (West Germany). Fachbereich ARUBi.
MISSIONS AND INSTRUMENTS OF REGIONAL AND LAND PLANNING [AUFGABEN UND INSTRUMENTE DER REGIONAL- UND LANDESPLANUNG] c45
Dieter Eberle *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 104-105 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

The regional and land planning instruments resulting from studies of surface utilization reduction; resource conservation; and coordination of the open air functions are described. Self development and conurbation areas are used in construction land potential models with little integration of climatic ecological aspects.
Author (ESA)

N86-21053 Deutscher Wetterdienst, Offenbach am Main (West Germany).
REPRESENTATION OF LOCAL CLIMATIC PHENOMENA AND RESULTING BIOCLIMATIC REPORTS IN REGIONAL PLANNING [DIE DARSTELLUNG LOKALKLIMATISCHER PHAENOMENE UND DARAUS RESULTIERENDE BIOKLIMATISCHE AUSSAGEN IN DER REGIONALPLANUNG]
V. Vent-Schmidt *In its* Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 106-108 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

Bioclimatic relevant phenomena (radiation ratio, formation of cold air, appearance of local wind systems, ground inversion, and ground fog) are investigated to assess the local climatic variations for city planning. Maps, charts, and tables are drawn based on climatic elements for planning proposals and a visualization of the results (wind build-up, fog structure, and frost damage). A simulation of the future situations or planning proposals can be done using model results. Author (ESA)

N86-21054 Lodz Univ. (Poland). Dept. of Meteorology, Climatology and Hydrology.
RELATIONSHIPS BETWEEN AIR TEMPERATURE AND WIND FIELD IN ATMOSPHERIC BOUNDARY LAYER. EXAMPLE OF WESTERN PART OF THE POLISH BALTIC SEA
Ireneusz H. Dubaniewicz *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 109-111 refs (For primary document see N86-21012 11-47)
Avail: Issuing Activity

The relationship between air temperature and air circulation is analyzed based on measurements in coastal areas (sea dune and urban built-up areas). The influence of the town area and built-up areas on thermal and humidity conditions can be noticed in the daily changes of air temperature. Urban areas influence the topoclimatic conditions of medical treatment and recreation in coastal areas. Author (ESA)

N86-21055 Ceskoslovenska Akademie Ved, Bratislava. Inst. fuer Bauwesen und Architektur.
DETERMINATION OF THE BASIC RADIATION CLIMATIC PARAMETERS OF A GIVEN LOCATION [BESTIMMUNG DER GRUNDPARAMETER DES STRAHLUNGSKLIMAS EINER BELIEBIGEN LOKALITAET]
Janka Pulpitlova *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 112-113 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

Calculation procedures for simulation of quantitative and qualitative radiation climate parameters were assessed. The Angstrom equation can be applied to determine the average monthly total radiation quantity of the surface energy thickness of global and diffusion radiation on a horizontal surface measured in a given location (villages and cities). Regression factors of the relative sunshine correlative dependence should be applied for construction and city planning. Measures in villages and cities show good agreement with theoretical results. Author (ESA)

N86-21056 Innsbruck Univ. (Austria). Inst. fuer Medizinische Physik.
RECENT MEASUREMENTS OF THE ALBEDO OF VARIOUS SURFACES FOR ERYTHERMAL EFFICIENT RADIATION [NEUERE MESSUNGEN DER ALBEDO VERSCHIEDENER OBERFLAECHEN FUER ERYTHEMWIRKSAME STRAHLUNG]
Mario Blumthaler and Walter Ambach *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 114-115 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

Albedo dependent on the diffuse sky radiation for erythermal efficient solar radiation on highly reflecting snow-covered and bare surfaces was investigated. The erythermal efficient radiation intensity was measured to determine the relationship with albedo. Various oriented areas were used as a model for the exposed body parts of a fictitious person. A significant difference is noted between erythermal efficient solar radiation and global radiation. With weakly reflecting snow-covered surfaces and with bare areas albedo is smaller for erythermal efficient solar radiation than for global radiation. Snow-covered surfaces with high albedo present less differences in radiation intensities for variously oriented areas. For bare areas the radiation intensities depend on the orientations of the areas. The results can be applied for skin radiation intensity assessment in snow-covered high mountains. Author (ESA)

N86-21057 Deutscher Wetterdienst, Offenbach am Main (West Germany).
CARTOGRAPHIC EXTRAPOLATION OF BIOCLIMATICALLY RELEVANT PARAMETERS FOR REGIONAL PLANNING [KARTOGRAPHISCHE UMSETZUNG BIOKLIMATISCH RELEVANTER PARAMETER FUER DIE REGIONALPLANUNG]
W.-P. Gerth *In its* Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 116-118 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

Climatologically relevant parameters for characterization of area utilization for residence and habitation and their threshold values are investigated using mappings based on inversion occurence in the investigated area, the mean yearly wind velocity, the numoer of heat stress days, and local climatic particularities. The results show good agreement with investigations using climate models. Areas with bioclimatic stress are not suitable for further house construction due to the construction density. Areas without air circulation outlets are not suitable for residence due to insufficient nocturnal cooling during heat stress days. The same criteria can be applied for areas with medium or reduced bioclimatic stresses. Author (ESA)

N86-21058 Austrian Automobile Touring Club, Vienna. Medizinmeteorologischer Beratungsdienst.
HUMAN BIOCLIMATIC CLASSIFICATION METHODS ILLUSTRATED WITH EXAMPLES OF SELECTED COUNTRIES [HUMANBIOKLIMATISCHE KLASSIFIZIERUNGSMETHODEN AM BEISPIEL AUSGEWAEHLTER LAENDER] c52
Othmar Harlfinger *In* Deutscher Wetterdienst Annals of Meteorol-

ogy, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 119-121 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

The analysis of meteorological parameters for tourism, recreation, and outdoor activities with respect to climatic comfort and discomfort is illustrated. Consideration of the thermal hygrometric area using model calculations or bioclimatologically complex factors to determine the boundary between comfort and discomfort; methods for determination of tourist season based on climatic parameters; and a combination of the first two methods with differential weighting of climatic and bioclimatic factors are used in bioclimatic holiday counseling. Author (ESA)

N86-21059 Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria).
COMPARISON BETWEEN METEOROLOGICAL COMPLEX VALUES AND A MODEL OF MAN'S ENERGY BUDGET [VERGLEICH ZWISCHEN METEOROLOGISCHEN KOMPLEXGROESSEN UND EINEM ENERGIEBILANZMODELL DES MENSCHEN] **c52**
Norbert Hammer, Elisabeth Koch, and Ernst Rudel *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 122-123 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

Heat and cooling parameters are compared to comfort criteria resulting from a model of man's energy budget with respect to sitting, slow and rapid walking, and dressing according to seasons. Assessment using equivalent temperature limits shows good agreement with energy budget methods during a 300 W activity and the cooling factor during a light sport activity. The results show a need for further investigation using the energy budget model to give physicians information on therapeutic applications of climate. Author (ESA)

N86-21060 Rheinisch Westfaelische Technischer Ueberwachungs-Verein e.V., Essen (West Germany).
A PROPOSAL FOR CONSIDERATION OF LOCAL OROGRAPHIC DATA IN LOCAL PLANNING [EIN VORSCHLAG ZUR BERUECKSICHTIGUNG LOKALER OROGRAPHISCHER GEGEBENHEITEN BEI DER STANDORTPLANUNG]
C.-J. Richter *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 124-125 In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

The Gaussian propagation model is applied to forecast immission in orographic areas using wind direction, velocity, and propagation class measurements. Wind direction distribution was measured for 10 yr to obtain statistical data on the propagation class in orographic locations. Comparison of the measurements leads to a four dimensional occurrence distribution. A channelling effect is noticed for temporary measurement location. The duration of the temporary measurement should be oriented towards orographic data on the facility location besides weathering. The stronger the channelling effect, the shorter the comparison measurement period. Temporary measurements can be used for forecasting only through comparison with long duration statistical data. Author (ESA)

N86-21061 Rheinisch Westfaelische Technischer Ueberwachungs-Verein e.V., Essen (West Germany).
EMPIRICAL PROCEDURES FOR DETERMINATION OF ODOR EMISSION AND EXTRAPOLATION TO REPRESENTATIVE PERCEPTION OCCURRENCE [EMPIRISCHE VERFAHREN ZUR EMITTLUNG VON GERUCHIMMISSIONEN UND DIE UEBERTRAGBARKEIT AUF REPRAESENTATIVE WAHRNEMUNGSHAEUFIGKEITEN]
Wolfgang Medrow *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 126-127 ref In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

The grid method and flag method were applied to determine environmental odor emission from diffusive sources without specified emission conditions such as purification station and dumping areas, to check odor perception. In the grid method the occurrence of odor perception for each grid intersection is deduced from the ratio of the number of inspections with odor perception to the total member of inspections. The odor perception occurrence must be weighted with a comparison of the whole-year and short-time wind direction distribution for representativeness. The flag method takes into account the whole-year wind direction, wind velocity and propagation class distribution to calculate the statistical odor perception occurrence; statistical conclusion on odor emission could be made using a propagation mathematical model and medium odor flow and representative propagation class statistics. Author (ESA)

N86-21062 Technische Univ., Munich (West Germany). Lehrstuhl fuer Bioklimatologie und Angewandte Meteorologie.
APPLICATION OF FISHEYE PHOTOGRAPHS FOR HUMAN BIOMETEOROLOGICAL ISSUES [VERWENDUNG VON FISHEYE-AUFNAHMEN FUER HUMANBIOMETEOROLOGISCHE FRAGESTELLUNGEN]
Annie Rall *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 128-129 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

Horizontograms processed from shots of the sky using a camera fitted with a fisheye lens were used to obtain location information such as sunshine duration. By visual assessment absorption or emission coefficients can be determined as well as the surrounding surface. A computer program based on digitized data of the horizon can calculate the maximum insolation duration for a specific day in the year. Using a coordinate transformation the image is divided into pixels of identical space angle ratio. The horizontogram procedure is accurate and reproducible. It allows rational assessment and gives important data for application of energy budget models. Horizontograms can be used for assessment of land utilization (construction planning and environment decontamination) and for forest damage investigations. Author (ESA)

N86-21063 Technische Univ., Hanover (West Germany). Inst. fuer Meteorologie und Klimatologie.
MEASUREMENTS OF SURFACE TEMPERATURE IN DIFFERENTIALLY EXPOSED GREENHOUSES WITH OR WITHOUT VEGETATION [MESSUNGEN VON OBERFLAECHENTEMPERATUREN IN GARTENHOEFEN VERSCHIEDENER EXPOSITION MIT UND OHNE VEGETATION]
Fritz Wilmers *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 130-131 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

The surface temperatures in differentially exposed experimental gardens were measured in the course of the day (mornings, midday, evenings) using an infrared scanner. Differential temperatures are recorded for vegetation on walls, on the ground; flower beds, trees, and ornamental ponds. A smoothing of extreme temperatures is noticed. Walls and flower beds are relatively temperate except in shadowy areas. Groves and trees provide temperature balance in microclimate and air humidification. Watery surfaces have cooling effects on warm days and store heat at night. Application of these data can improve man's environment and thermal comfort. Author (ESA)

N86-21064 Deutscher Wetterdienst, Offenbach am Main (West Germany).
LOCAL CLIMATIC PARTICULARITIES AND THEIR IMPORTANCE FOR RECREATION AREA (EXAMPLE, SAARLAND-LOWER BLIESTAL) [LOKALKLIMATISCHE BESONDERHEITEN IN IHRER BEDEUTUNG FUER ERHOLUNGSGEBIETE (AM BEISPIEL SAARLAND-ERHOLUNGSRAUM UNTERES BLIES-

TAL)] c52
Hans Juergen Swantes *In its* Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 132-133 ref In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

A medico-meteorological-bioclimatic assessment of Saarland (West Germany) was made for construction of a recreation network. It is based on investigations of local wind circulation and cloud cover and air pollution in valleys. Air temperature and air humidity are measured. Inquiry forms are distributed to farmers, walkers, and highway engineers to obtain further information on local climatic particularities. Results of the measurement and written inquiry campaign are mapped to give information on the investigated area planning and utilization for adequate recreation forms according to bioclimatic criteria. Author (ESA)

N86-21065 Deutscher Wetterdienst, Freiburg (West Germany). Zentrale Medizin-Meteorologische Forschungsstelle.
SPATIAL DISTRIBUTION OF HEAT AND COLD STRESS IN THE FEDERAL REPUBLIC OF GERMANY [DIE RAEUMLICHE VERTEILUNG VON WAERMEBELASTUNG UND KAELTESTRESS IN DER BUNDESREPUBLIK DEUTSCHLAND] c52
G. Jendritzky *In its* Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 134-136 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

A stochastic climate model based on data of cooling effects on the thermoregulatory system was developed to design monthly differential climate maps for description of the thermal environment in city and environmental planning. The model is standardized with respect to individual thermoregulation differences, to Sun-shadow difference and to heat loss conditions. The small-scale effects on orography or vegetation as well as UV radiation, oxygen partial pressure, and air hygiene are not taken into account. The maps constitute a standardized basis for space comparison with respect to efficiency, thermal comfort, and human health.
Author (ESA)

N86-21066 Technische Univ., Berlin (West Germany). Fachgebiet Bioklimatologie.
RESULTS OF CITY CLIMATOLOGICAL INVESTIGATIONS IN WEST BERLIN [ERGEBNISSE STADTKLIMATISCHER UNTERSUCHUNGEN IN BERLIN (WEST)]
Manfred Horbert, Annette Kirchgeorg, and Albrecht vonStuelpnagel *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 137-139 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

Climatic maps based on measurement of air temperature, relative air humidity, vapor pressure and equivalent temperature were designed for qualitative and quantitative assessement of city-climate effects. Distributions of the parameters are analyzed for land utilization and city planning. The temperature distribution shows a difference between city center and outer districts. The influence of construction density and vegetation on the wind direction is analyzed. Average annual temperatures and average minimum temperatures are used to map the areas with city-climatic changes. Tendency to overheating, night cooling, and frost hazards; humidity changes; modification of the ground-layer wind behavior; and interaction between various climatic areas and emission hazards are described for each city area. Author (ESA)

N86-21067 Institute of Balneology and Climatology, Poznani (Poland).
APPLICATION OF METEOROLOGICAL AND SOLAR DATA IN HEALTH RESORT CLIMATHERAPY c52
Sabina Tyczka and Irena Ponikowska *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 140-141 (For primary document see N86-21012 11-47)
Avail: Issuing Activity

A quantitative analysis of the thermal and photochemical effects of solar radiation on 150 healthy patients aged 18 to 60 is made to determine the effectiveness of heliotherapy using long-term actinometric data and the intensity of ultraviolet solar radiation corresponding to the Sun exposure time necessary to obtain a skin photoerythema. Global solar radiation is analyzed in relation to the mean photoerythema dose, to the Sun's altitude and to cloudiness. The skin photoerythema dose is the product of solar radiation intensity and Sun exposure time. The results are valid for insolation conditions similar to those on the Baltic coast with solar altitude of 50 to 60 deg. Author (ESA)

N86-21068 World Meteorological Organization, Geneva (Switzerland).
COMPOSITION OF THE WMO
Oct. 1985 136 p
(WMO-5) Copyright. Avail: NTIS MF A01; print copy available at WMO, Geneva, Switzerland

The membership of the World Meteorological Organization is given. Nations are listed, as well as the names, titles and addresses by individuals. R.J.F.

N86-21069*# FWG Associates, Inc., Tullahoma, Tenn.
ANALYSIS OF AERODYNAMIC COEFFICIENTS USING GRADIENT DATA: SPANWISE TURBULENCE EFFECTS ON AIRPLANE RESPONSE Report, 3 Jun. 1983 - 2 Jun. 1985
Erik A. Ringnes and Walter Frost Washington NASA Feb. 1986 70 p refs
(Contract NAS8-35186)
(NASA-CR-3961; NAS 1.26:3961) Avail: NTIS HC A04/MF A01 CSCL 04B

The influence of spanwise turbulence on airplane dynamic behavior is determined. Calculations are based on data collected from test flights with the NASA B-57 research aircraft. The approach is to first compute aerodynamic forces and moments due to a spanwise distribution of angle of attack and airspeed. Secondly, these quantities are incorporated into the equations of motion. Simulation of flights done with the effects of spanwise turbulence included are compared to simulations without any spanwise turbulence. The findings of the study are that the moments developed by turbulence along the span are significant and that more realistic flight simulation can be achieved by including the spanwise turbulence terms. Author

N86-21070# Hawaii Univ., Honolulu. Dept. of Meteorology.
THE APPLICATION OF A WIND FLOW MODEL FOR COMPLEX TERRAIN AREAS ON OAHU: A COMPARISON WITH OBSERVATIONS AND OTHER MODELS
D. Andre Erasmus Nov. 1985 70 p refs
(UHMET-85-01) Avail: NTIS HC A04/MF A01

Erasmus has formulated a boundary layer wind flow model for complex terrain areas where the basic flow is onshore and at least of moderate strength. The model was applied to the Kahuka area on the island of Oahu, Hawaii. The model was evaluated by comparing observed and simulated winds during two periods of persistent trade winds and two periods of intermittent trades. The results of this evaluation are summarized. Under trade wind conditions, the observed and simulated winds at test stations agree very well. Author

N86-21071*# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
SURFACE ENERGY FLUXES IN COMPLEX TERRAIN Progress Report, 1 Feb. 1985 - 28 Feb. 1986
Elmar R. Reiter, John D. Sheaffer, and James E. Bossert Mar. 1986 42 p refs
(Grant NAGw-601)
(NASA-CR-176594; NAS 1.26:176594) Avail: NTIS HC A03/MF A01 CSCL 04B

The emphasis of the 1985 NASA project activity was on field measurements of wind data and heat balance data. Initiatives included a 19 station mountaintop monitoring program, testing and refining the surface flux monitoring systems and packing and

shipping equipment to the People's Republic of China in preparation for the 1986 Tibet Experiment. Other work included more extensive analyses of the 1984 Gobi Desert and Rocky Mountain observations plus some preliminary analyses of the 1985 mountain-top network data. Details of our field efforts are summarized and results of our data analyses are presented. Author

N86-21072*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
TRANSIENT CONVECTION OVER THE AMAZON-BOLIVIA REGION AND THE DYNAMICS OF DROUGHT OVER NORTHEAST BRAZIL
Julio Buchmann (Univ. Federal do Rio de Janeiro, Brazil), Pedro LeitedaSilvaDias (Inst. Astronomico e Geofisico da USP), and Antonio Divino Moura Nov. 1985 34 p refs Sponsored in part by FINEP and by CNPq
(Grant NAG5-127)
(NASA-CR-176617; NAS 1.26:176617; INPE-3723-RPE/497) Avail: NTIS HC A03/MF A01 CSCL 04B

A two layer, nonlinear, equatorial beta-plane model, in p-coordinates is used to study the atmospheric response to a large scale prescribed heat source varying in time. The heat source is meant to represent a convective burst with total duration of approximately 48 hours over the Amazon/Bolivia region. The boundary conditions used are meridional velocity zero at 60 deg S, omega w = 0 at the top and zero geometric velocity at the lower boundary. Sensitivity study was done which includes initial state at rest, compared with realistic initial flow. The scale of the heat source is 1500 km in latitude and longitude and it is centered at 10 deg S. Special attention is paid to the distribution and intensity of the induced vertical motion. The model is integrated for two days and the preliminary results show agreement with the observed 200 mb flow. Of interest is the establishment of a trough and descending motion to the northeast of the heat source. A conjucture is thus made that the Amazon heat source and its fluctuations bear some relationship with the drought problem over Northeast Brazil. Author

N86-21073# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
TELECONNECTIONS BETWEEN THE RAINFALL OVER NORTHEAST BRAZIL AND THE WINTER CIRCULATION OF NORTHERN HEMISPHERE
V. Brahmananda Rao and Jose I. B. deBrito Oct. 1985 21 p refs Submitted for publication
(INPE-3696-PRE/840) Avail: NTIS HC A02/MF A01

Linear correlation coefficients are calculated between the geopotential heights for the winter months at 700mb (December, January and February) over Northern Hemisphere and the March rainfall over Northeast Brazil. Isolines of correlation coefficient showed interesting patterns and regions of significantly high correlation. The occurrence of PNA pattern is interpreted as a connection between the Northern Hemisphere winter circulation and NE Brazil rainfall through El Nino - Southern oscillation phenomena. The negative center over North-West United States in the PNA pattern has also a direct relationship to the NE Brazil rainfall. Author

N86-21074# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
STABILITY OF AN OCEANIC FRONT
Alejandro Livio Camerlengo Nov. 1985 25 p refs Presented at the I Encontro Regional de Geofisica, Sao Jose dos Campos, Brazil, 27-29 Nov., 1985
(INPE-3727-PRE/859) Avail: NTIS HC A02/MF A01

It is analytically shown that in the case of oceanic fronts in the upper layer, instability due to horizontal shear may only be possible on very small horizontal scales. Therefore, in the specific case of the Pacific Ocean Subarctic Front, barotropic instability should not occur. Author

N86-21075# Air Force Systems Command, Patrick AFB, Fla.
STATUS REPORT ON UPGRADE OF WEATHER FORECAST SUPPORT TO SHUTTLE OPERATIONS Progress Report, 1984 - 1985
T. M. Myers and B. F. Boyd 28 Feb. 1985 14 p
(AD-A159137; ESMC-TR-85-03) Avail: NTIS HC A02/MF A01 CSCL 04/2

The report details the background of a joint USAF and NASA project to upgrade the forecast inputs at the Cape Canaveral Forecast Facility (CCFF) in support of space shuttle and missile launch operations at the Eastern Test Range (ETR). The short range and microscale forecast requirements for shuttle could not be met with the inplace technology. To deal with this support capability shortfall, NASA and the USAF (Det 11, 2WS and the Eastern Space and Missile Center) initiated a Meteorological Systems Modernization Program (MSMP). The intent of this weather support upgrade is to minimize the impacts of the environment on the shuttle by providing the most accurate possible forecast advice to support managers during processing, launch, and recovery operations. Shuttle weather sensitivities are presented along with the architecture of the forecast support system being assembled to meet these challenges. Author (GRA)

N86-21076# Massachusetts Inst. of Tech., Cambridge. Center for Meteorology and Physical Oceanography.
EXPERIMENTAL RUNS WITH A LOW-ORDER MODEL OF A MOIST GENERAL CIRCULATION Final Report, 24 Nov. 1982 - 31 Mar. 1985
E. N. Lorenz 31 May 1985 24 p
(Contract F19628-83-K-0012)
(AD-A160359; AFGL-TR-85-0118) Avail: NTIS HC A02/MF A01 CSCL 04/2

We have made some experimental runs with a very-low-order general-circulation model, which includes the thermodynamic and radiative effects of water vapor and liquid water in the atmosphere. We first made several runs lasting 20 years or longer, to determine suitable combinations of values of model parameters for use in subsequent experiments. Using one suitable combination, we made one 450 year run, and found that the globally averaged atmospheric temperature underwent long-period fluctuations with a range of about two degrees, resembling real atmospheric climatic changes. In some final runs we suppressed the influence of cloudiness on the global albedo, and found that this modification eliminated the high sensitivity of the temperature to the plantary temperature and the very slow approach of the temperature to equilibrium, which characterized the ordinary runs. Thermodynamic and radiative effects of water. GRA

N86-21077# Air Force Geophysics Lab., Hanscom AFB, Mass.
THE AFGL GLOBAL SPECTRAL MODEL: EXPANDED RESOLUTION BASELINE VERSION Final Report, 1 Oct. 1982 - 30 Sep. 1984
S. Brenner, C. H. Yang, and K. Mitchell 16 Nov. 1984 80 p
(AF Proj. 2310)
(AD-A160370; AFGL-TR-84-0308; AFGL-ERP-895) Avail: NTIS HC A05/MF A01 CSCL 04/2

The flexible resolution/truncation baseline version of the AFGL global spectral model as adapted to the CRAY-1 is described. A series of low-resolution and high-resolution forecasts were run and compared to test the performance of the model. In general, higher resolution resulted in improved forecast skill in the 24-to-96-hour range. The only exception to this is the humidity forecast, which shows minimal skill. This characteristic is rather insensitive to the resolution partly because of the poor quality of analyzed humidity fields used for initial data and verification. The original gridded (2.5 X 2.5 deg) topography has been replaced by a smoothed terrain field that has been passed through a nine-point smoother, interpolated to the model's Gaussian grid, and then spectrally truncated. Finally, the effects of initialization have been studied by comparing a series of forecasts subjected to several initialization methods. For forecasts beyond 24 hours, the model is able to supress spurious gravity waves through the combined effects of the semiimplicit time scheme and the subgrid scale diffusion. The impact of normal mode initialization is seen mainly in the very short-range forecasts (less than 24 hours) and is thus important

for providing smooth first-guess fields for the analysis/data assimilation cycle. GRA

N86-21078# Transportation Systems Center, Cambridge, Mass.
THE STAPLETON MICROBURST ADVISORY SERVICE PROJECT: AN OPERATIONAL VIEWPOINT Final Report, Jun. 1984 - Sep. 1985
Lloyd Stevenson Sep. 1985 80 p
(AD-A161543; DOT-TSC-FAA-85-8; DOT/FAA/PM-85/21) Avail: NTIS HC A05/MF A01 CSCL 04/2

A microburst advisory service project was conducted at Stapleton International Airport for a six week period during the summer of 1984. This report describes what took place during the project and what was learned from an operational, air traffic control viewpoint. Specifically, the report describes: (1) The operational, Doppler weather radar-based, microburst advisory service provided to pilots; (2) An unplanned and informal, Doppler radar-based, gust front advisory service initiated partway through the project and used by the FAA for runway management purposes; (3) The operational impact on runway operations of an unexpected, low-altitude, wind shear feature in which individual microbursts form a relatively long-lived line structure; and (4) The low-altitude wind shear environment faced by Stapleton controllers and pilots during the six week project, which took place at the peak of the Denver thunderstorm season. A microburst is a small, short-lived, low-altitude, thunderstorm-related, wind shear feature that can exhibit an intense, complex wind shear pattern that can be particularly hazardous to landing and departing aircraft. GRA

N86-21079# Lawrence Livermore National Lab., Calif.
SIMPLE TRAJECTORY MODEL USING METEOROLOGICAL DATA ON AN IRREGULAR GRID
J. J. Walton Aug. 1985 9 p
(Contract W-7405-eng-48)
(DE86-001688; UCID-20557) Avail: NTIS HC A02/MF A01

A simple trajectory model has been developed that uses wind and temperature observations on an irregular grid. No diffusion calculation is performed but a number of parcels, injected at different locations and heights can be followed. The present version of the code has been driven using data from the NAMER-WINDTEMP tapes. DOE

N86-21080# Los Alamos National Lab., N. Mex.
OVERVIEW OF CLIMATIC EFFECTS OF NUCLEAR WINTER
E. M. Jones and R. C. Malone 1985 24 p refs Presented at the American Anthropological Society, Washington, D.C., 4 Dec. 1985
(Contract W-7405-eng-36)
(DE85-015738; LA-UR-85-2686; CONF-851225-1) Avail: NTIS HC A02/MF A01

A general description of the climatic effects of a nuclear war are presented. This paper offers a short history of the subject, a discussion of relevant parameters and physical processes, and a description of plausible nuclear winter scenario. DOE

N86-21081# Columbia Univ., Palisades, N.Y. Geological Observatory.
ARCTIC CLOUD COVER DURING THE SUMMERS OF 1977-1979
D. A. Robinson, G. J. Kukla, and M. C. Serreze 1985 182 p refs
(Contract DE-AC02-81EV-10665)
(DE86-000729; DOE/EV-10665/6; LDGO-85-5) Avail: NTIS HC A09/MF A01

Cloud cover in the Artic Basin has been charted from satellite images at approximately 3 day intervals for the months of May to August from 1977 to 1979. Three classes of cloud thickness at three altitudes were mapped and digitized together with sea level pressure. Cloudiness was found to be heterogeneous in space and time. Optically thick clouds had high tops and were associated with low pressure systems and airmasses advected from the south. Clouds of moderate thickness were the most prevalent. Cloud-free skies were most often colocated with high pressure. The central Arctic was cloudest, whereas the Canadian Archipelago was least cloudy. Overall, thick clouds were considerably less common than in earlier analyses drawn from ground and drifting station data. Cloud-free episodes throughout the basin persisted long enough to significantly affect the surface radiation budget and the dissipation of snow and ice. Our results indicate that climate models which attempt to assess the impact of CO2 on the radiation budget in the high latitudes should take into account the heterogeneity of cloud extent, thickness and height in the Arctic Basin. DOE

N86-21082# Oregon State Univ., Corvallis. Wind Resources Assessment Lab.
WAKE VELOCITY DEFICIT MEASUREMENTS AT THE GOODNOE HILLS MOD-2 SITE: A SUMMARY OF THE 1982 AND 1984 FINDINGS
R. W. Baker and S. N. Walker Aug. 1985 102 p
(Contract DE-AC79-81BP-29182)
(DE85-018284; DOE/BP-29182/15) Avail: NTIS HC A06/MF A01

The wake velocity deficits and turbulence levels measured behind the Goodnoe Hills MOD-2 2500 kW wind turbine generators using portable kite anemometers are described. The measured deficits are compared to those calculated from two different wake models as well as to those measured by other research scientists at the Goodnoe Hills test facility. DOE

N86-21083# Pacific Northwest Lab., Richland, Wash.
IMPROVING THE PERFORMANCE OF MASS-CONSISTENT NUMERICAL MODELS USING OPTIMIZATION TECHNIQUES
J. C. Barnard, H. L. Wegley, and T. R. Hiester Sep. 1985 33 p
(Contract DE-AC06-76RL-01830)
(DE86-001224; PNL-5566) Avail: NTIS HC A03/MF A01

This report describes a technique of using a mass-consistent model to derive wind speeds over a microscale region of complex terrain. A serious limitation in the use of these numerical models is that the calculated wind field is highly sensitive to some input parameters. Because accurate values for these parameters are not usually known, confidence in the calculated winds is low. However, values for these parameters can be found by tuning the model to existing wind observations within a microscale area. This tuning is accomplished by using a single-variable, unconstrained optimization procedure that adjusts the unknown parameters so that the error between the observed winds and model calculations of these winds is minimized. Model verification is accomplished by using eight sets of hourly averaged wind data. When the model is tuned to a small subset of 30 sites, an accurate determination of the wind speeds was made for the remaining sites in six of the eight cases. Therefore, when this technique is used, numerical modeling shows great promise as a tool for microscale siting of wind turbines in complex terrain. DOE

N86-21084# Technische Hochschule, Aachen (West Germany). Dept. of Aerospace Engineering.
WIND SHEAR MEASUREMENT ON BOARD A MORANE 893
H. Nelles 1985 21 p refs
Avail: NTIS HC A02/MF A01

To investigate wind shear during flight, a pneumatic sensing device was developed and installed on board a single engine light aircraft. The device measures the difference in total pressure between two positions vertically displaced from the airplane. The mass flow rate created by the difference in pressure is measured by a hot-wire probe. The signal of this probe is a function of the wind shear. Results compare favorably with those of a ground based sensing system and a D028 research aircraft. Author (ESA)

N86-21085# Hamburg Univ. (West Germany). Fachbereich Geowissenschaften.
THE INFLUENCE OF ANTHROPOGENIC AEROSOL PARTICLES ON THE RADIATION BUDGET OF THE ATMOSPHERE Ph.D. Thesis [EINFLUSS ANTHROPOGENER AEROSOLTEILCHEN AUF DEN STRAHLUNGSHAUSHALT DER ATMOSPHAERE]
Madeleine Newiger 1985 109 p refs In GERMAN Sponsored

by Commission of European Communities Original contains color illustrations
(Wiss-Abhandl-73) Avail: NTIS HC A06/MF A01

The influence of anthropogenic aerosol particles on the atmospheric radiation budget was estimated via the changes of the climate parameters albedo and net radiant flux. Besides the directly emitted particles, the significance in the atmosphere of particles resulting from sulfur dioxide emission was studied. The particle concentrations were calculated with a two-dimensional transport model; the particle size distribution was described by a modified exponential function. Anthropogenic aerosol particles cause an increase of the average albedo of the Northern Hemisphere; soot reduces the albedo increase. In winter the albedo increases by 0.3 to 0.54% depending on particle absorption capacity, in summer it increases by 0.53% to 0.79%. It is shown that the emissions of aerosol particles and CO2 particles have on opposite effect on the radiation budget. On the Earth surface the net flux reduction due to particle emission is compensated by CO2 doubling. On the outer border of the atmosphere the CO2 effect dominates. Author (ESA)

N86-21086# Battelle Pacific Northwest Labs., Richland, Wash.
INTRODUCTION TO MICROMETEOROLOGICAL AND TRACER DATA ARCHIVE PROCEDURES Final Report
J. G. Droppo and C. R. Watson Aug. 1985 59 p
(Contract EPA-68-02-4063)
(PB85-235216; EPA-600/3-85-053) Avail: NTIS HC A04/MF A01 CSCL 04B

A user oriented introduction to the archive structure and contents is provided. The archive includes both documentation and data. A data set documentation report is prepared for each archived data set. The archived data are contained within a well-defined structure called data map. Standard words are used for mapping variables and their units within the various data sets. This feature allows global scanning of data sets for specific variables. The data structure is designed so that selected portions may be loaded into the user's data base system or it may be accessing using a custom computer program. An example of a computer code for accessing the data is given. GRA

N86-21087# Battelle Pacific Northwest Labs., Richland, Wash.
MINNESOTA 1973 ATMOSPHERE BOUNDARY LAYER EXPERIMENT: MICROMETEOROLOGICAL AND TRACER DATA ARCHIVE, SET 001 DOCUMENTATION REPORT Final Report
R. K. Woodruff, J. S. Droppo, and C. S. Glantz Aug. 1985 22 p
(Contract EPA-68-02-4063)
(PB85-243152; EPA-600/E-85-054) Avail: NTIS HC A02/MF A01 CSCL 04B

An archive for micrometeorological and tracer dispersion data was developed by Battelle, Pacific Northwest Laboratories for the U.S. Environment Protection Agency. The archive is designed to make the results of extensive field tests readily accessible to EPA for model testing, development, and verification efforts. Documentation is provided for one of the archived data sets, the Minnesota 1973 Boundary Layer Experiment. The aim of the effort is to achive invaluable data sets in a timely fashion before the necessary supporting information about the data becomes lost forever. The entries in the documentation report are as follows: data set fact summary, a narrative description of experiment and data, special information, references, a description of archive data files, contacts (names, addresses, and phone numbers) and standard experiment summary table. GRA

N86-21088# National Climatic Center, Asheville, N. C.
TROPICAL CYCLONES OF THE NORTH ATLANTIC OCEAN, 1871-1980 (WITH STORM TRACK MAPS UPDATED THROUGH 1984)
C. J. Neumann, G. W. Cry, E. L. Caso, and B. R. Jarvinen Jul. 1985 181 p Prepared in cooperation with National Hurricane Center, Coral Gables, Fla. and National Hurricane Research Lab., Coral Gables, Fla.
(PB85-246163) Avail: NTIS HC A09/MF A01 CSCL 04B

North Atlatnic tropical cyclone tracks and certain basis statistical summaries are presented. The availability of storm tracks for the complete 110-year period 1871 to 1980 provide information on the climatology of tropical cyclones. GRA

N86-21089# National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Sciences Group.
DIURNAL AND SPATIAL VARIABILITY OF LIGHTNING ACTIVITY IN NORTHEASTERN COLORADO DURING THE SUMMER
R. E. Lopez and R. L. Holle Mar. 1985 44 p
(PB85-212173; NOAA-TM-ERL-ESG-14) Avail: NTIS HC A03/MF A01 CSCL 04B

Lightning data obtained in 1983 from a network of three direction finders were studied to ascertain the diurnal development of space distributions of flash frequencies. The influence of the underlying topography and the resulting diurnal circulations on the time and place of lighting strokes was very apparent. In addition, the data showed that lightning is relatively rate, and exhibits a very large day-to-day variability. This study also emphasizes the utility of the type of data employed, to study the characteristics not only of lightning as such but also of topographically induced convection in general. GRA

N86-21090# National Hurricane Center, Coral Gables, Fla.
ANNUAL DATA AND VERIFICATION TABULATION ATLANTIC TROPICAL CYCLONES, 1984
G. B. Clark and R. A. Case Feb. 1985 280 p
(PB85-211332; NOAA-TM-NWS-NHC-26) Avail: NTIS HC A13/MF A01 CSCL 04B

This is the eleventh report of an annual series prepared by the National Hurricane Center (NHC) to provide a source of summaried data on Atlantic tropical cyclones. It will not duplicate the narrative overview of the hurricane season or the description of individual storms, which will continue to be published in the Monthly Weather Review. In addition to data supplied by the National Weather Service, materials have been furnished by the NOAA Tropical Satellite and Analysis Center of NHC, and the CARACH (Chief Aerial Reconnaissance Coordination, All Hurricanes). This report also includes Probability Forecasts issued with advisories on landfalling United States tropical storms and hurricanes (Appendix B). GRA

N86-21091# National Severe Storms Lab., Norman, Okla.
NATIONAL SEVERE STORMS LABORATORY, FISCAL YEAR 1984 Annual Report, 1 Oct. 1983 - 30 Sep. 1984
Mar. 1985 53 p
(PB85-211092) Avail: NTIS HC A04/MF A01 CSCL 04B

Topics including: organization chart; personnel statisics; budget and funding; program areas (meteorological research, Doppler radar and storm electricity research, computer and engineering support and development, Cooperative Institute for Mesoscale Meteorological Studies); administrative group; grants and contracts; publications and reports of the laboratory, FY 1984; and Personnel of the National Severe Storms Laboratory are presented. GRA

N86-20447# Joint Publications Research Service, Arlington, Va.
VARIABILITY OF ATMOSPHERIC TRANSFER FUNCTION COMPONENTS Abstract Only
O. M. Pokrovskiy, V. M. Prokhorov, and T. F. Pchelova *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 64 refs Transl. into ENGLISH from Issledovaniye Zemli IZ Kosmosa (Moscow, USSR), no. 4, Jul. - Aug. 1985 p 9-20 Original language document was announced in IAA as A86-13277 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

N86-20888# Joint Publications Research Service, Arlington, Va.
AN-30 PHOTOGRAPHY AIRPLANE OUTFITTED FOR CLOUD-SEEDING MISSIONS
T. Kuznetsova and A. Pimenov *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 1-2 Transl. into ENGLISH from Pravda Ukrainy (Kiev, USSR), 15 Aug. 1985 p 4 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

N86-20889# Joint Publications Research Service, Arlington, Va.
FACILITY FOR MODELING ORIGINS OF TYPHOONS
A. Melnikov *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 3-4 Transl. into ENGLISH from Pravda (Moscow, USSR), 8 Jul. 1985 p 7 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

N86-20891# Joint Publications Research Service, Arlington, Va.
WORK ON MATHEMATICAL MODELING OF TROPICAL STORMS WAKES Abstract Only
A. Yakovlev *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 7 Transl. into ENGLISH from Gudok (Moscow, USSR), 29 Sep. 1985 p 4 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

N86-20893# Joint Publications Research Service, Arlington, Va.
HYDROPHYSICAL STUDIES FROM SHIP VEYMER IN NORTH ATLANTIC
In its USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 11 Transl. into ENGLISH from Sovetskaya Belorussiya (Minsk, USSR), 13 Aug. 1985 p 4 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N86-21092*# State Univ. of New York, Albany. Dept. of Geological Sciences.
WILSON STUDY CYCLES: RESEARCH RELATIVE TO OCEAN GEODYNAMIC CYCLES Final Report, 1 Jul. 1983 - 5 May 1985
William S. F. Kidd 5 May 1985 23 p refs
(Grant NAG3-333)
(NASA-CR-176560; NAS 1.26:176560) Avail: NTIS HC A02/MF A01 CSCL 08C

The effects of conversion of Atlantic (rifted) margins to convergent plate boundaries; oceanic plateaus at subduction zones; continental collision and tectonic escape; southern Africa rifts; and global hot spot distribution on long term development of the continental lithosphere were studied. B.G.

N86-21093# Naval Ocean Research and Development Activity, Bay St. Louis, Miss.
DEVELOPMENT OF A DEEP-TOWED ARRAY GEOPHYSICAL SYSTEM: A NEW CAPABILITY FOR DEEP-OCEAN ACOUSTIC MEASUREMENTS Final Report
Martin G. Fagot and Stephen E. Spychalski Jul. 1985 13 p
(AD-A162417; NORDA-74) Avail: NTIS HC A02/MF A01 CSCL 08/10

Development of a deep-towed seismic profiling system has been completed after four years of design, fabrication, and testing. This system provides the capability to determine the detailed acoustic character of the sea floor and upper 500 to 1000 m of subbottom structure. The system is designed for tow depths of 6000 m while operating at an altitude of 100 m above the sea floor. The major components of the system include: a sound source located in the deep-towed vehicle, which operates over a frequency range from 260 Hz to 650 Hz at a peak source level of 201 dB re 1 micropascal at 1 m; a 24 channel, 1000 m long array attached as a tail to the deep-towed vehicle; a duplex digital telemetry link to communicate with the deep-towed system over a coaxial tow cable; a digital data record system; a real time engineering data display system; a short baseline navigation system; handling hardware to deploy and retrieve the system; and two instrumentation vans to support system operations. This paper discusses the unique hardware developed for the deep-towed seismic system and focuses on the acoustic subsystems. Also reviewed is a performance prediction analysis initially performed to define geoacoustic parameter measurement improvements achievable with a deep-towed configuration. Field measurement engineering results acquired during the system's final performance evaluation are presented. Data was acquired at two depths of 4500 m. GRA

N86-21094# Rogers, Golden and Halpern, Inc., Reston, Va.
GULF OF MEXICO INDEX, AUGUST 1983 - OCTOBER 1984
Denise D. Molajo, Stephen P. Risotto, and Virginia A. Farris 1985 86 p
(Contract DI-14-12-0001-30042)
(TI85-902200; OCS/MMS-85-0043) Avail: NTIS HC A05/MF A01

The Gulf of Mexico Index listing relevant, actual or proposed programs, plans, reports, environmental impact statements, and other lease information was prepared by the Outer Continental Shelf Oil and Gas Information Program. The index is provided on a regular basis to coastal states, and, upon request, to local governments and the public. B.G.

N86-21095# Brookhaven National Lab., Upton, N. Y.
OCEANOGRAPHIC DATA FROM MOORED INSTRUMENTATION Data Report, Apr. 1979
T. S. Hopkins, W. J. Behrens, A. L. Swoboda, and E. G. Divis Apr. 1985 114 p refs
(Contract DE-AC02-76CH-00016)
(DE86-001194; BNL-36785) Avail: NTIS MF A01

Five instrumented moorings were deployed in the nearshore region off Shinnecock, Long Island, during April 1979. Four of the moorings each had four sensor packages at distributed depths recording velocity, conductivity, temperature and pressure over hourly intervals. The fifth mooring had two fluorometers at two depths. The average period of operation was 21 days. The data are shown here through statistics, real time plots, progressive vector diagrams, and stick figures of 4 hourly averaged currents. This mooring deployment was the observational focus of an oceanographic experiment called Meso-Scale Experiment (MESEX). An objective of MESEX was to observe meso-scale (order 10 km) advective fluxes of temperature, salinity and particulate chlorophyll over the inner shelf off Long Island. The supporting observations included the ADVANCE II cruise, the OCEANUS cruise, an air-sea interaction buoy and a drogue experiment. DOE

N86-21096# Centre National d'Etudes Spatiales, Toulouse (France). Centre Spatial.
STUDY OF THE APPLICATIONS OF ALTIMETRY DATA AND EXTRACTION METHODS Final Report [ETUDE SUR LES APPLICATIONS DES DONNEES D'ALTIMETRIE ET METHODES D'EXTRACTION]
A. deLeffe, M. Avignon, P. Raizonville, G. Cuvelier, and Y. Menard (Groupe de Recherches de Geodesie Spaciale, GRGS, Toulouse, France) 29 Jan. 1985 426 p refs In FRENCH
(Contract ESA-5812/84/NL-PB(SC))
(ESA-CR(P)-2113) Avail: NTIS HC A19/MF A01

The characteristics and utility of possible oceanographic and geophysics products are examined, refering to SEASAT results and to ERS-1 satellite possibilities. A global analysis of altimetric measurement errors is presented, estimating the amplitude and associated wavelength of the errors before and after correction. The main sources of error include instrument errors, for which a simulation computer program was developed in order to obtain quantitative estimations, errors due to ocean surface-electromagnetic interaction, propagation errors, and errors due to geophysical factors such as tides and atmospheric pressure. The algorithms used for SEASAT were studied, leading to data processing propositions for ERS-1. An external calibration strategy, using the laser site at Dakar, is also presented. Author (ESA)

N86-20894# Joint Publications Research Service, Arlington, Va.
PORT APPARATUS FOR REMOTE DETECTION OF SEA ROUGHNESS
In its USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 12 Transl. into ENGLISH from Sovetskaya Litva (Vilnius,

USSR), 24 Jul. 1985 p 4 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

N86-20895# Joint Publications Research Service, Arlington, Va.
DEVICE FOR ANALYZING UNDERWATER TV PICTURES WITH IR CAPABILITY
A. Isayev *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 14 Transl. into ENGLISH from Trud (Moscow, USSR), p 3 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

N86-20896# Joint Publications Research Service, Arlington, Va.
LONG-TERM PROGRAM TO STUDY OCEAN'S ENERGY-ACTIVE ZONES DESCRIBED Abstract Only
S. Lappo *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 18 Transl. into ENGLISH from Kommunist (Yerevan, USSR), 11 Sep. 1985 p 3 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

N86-20897# Joint Publications Research Service, Arlington, Va.
HYDROPHYSICAL EXPERIMENT MEZOPOLIGON-85 IN TROPICAL ATLANTIC
V. Titov *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 19 Transl. into ENGLISH from Vodnyy Transport (Moscow, USSR), 1 Oct. 1985 p 4 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

N86-20898# Joint Publications Research Service, Arlington, Va.
SEASONAL SOURCES OF THERMOHALINE CIRCULATION IN NORTH ATLANTIC Abstract Only
L. I. Galerkin, A. S. Monin, and S. V. Sergunin *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 20 Transl. into ENGLISH from Doklady Akademii Nauk SSSR (Moscow, USSR), v. 282, no. 3, May 1985 p 705-708 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

N86-20902# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF TAYLOR-HOGG CONE ON DENSITY FIELD STRUCTURE IN STRATIFIED OCEAN WITH PYCNOCLINE Abstract Only
M. B. Timonov and N. K. Shelkovnikov *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 23 Transl. into ENGLISH from Izvestiya Akademii Nauk SSSR: Fizika Atmosfery I Okeana (Moscow, USSR), v. 21, no. 7, Jul. 1985 p 752-758 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

N86-20903# Joint Publications Research Service, Arlington, Va.
MASLOV OPERATOR METHOD IN PROBLEM OF WAVES IN WATER GENERATED BY SOURCE MOVING OVER UNEVEN BOTTOM Abstract Only
S. Yu. Dobrokhotov and P. N. Khevandrov *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 24 Transl. into ENGLISH from Izvestiya Akademii Nauk SSSR: Fizika Atmosfery I Okeana (Moscow, USSR), v. 21, no. 7, Jul. 1985 p 744-751 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

N86-20904# Joint Publications Research Service, Arlington, Va.
EVALUATION OF COEFFICIENTS OF HEAT AND MOISTURE EXCHANGE BETWEEN OCEAN AND ATMOSPHERE Abstract Only
V. V. Yefimov, N. A. Timofeyev, Ye. N. Sychev, and I. V. Kurzheyevskiy *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 24-25 Transl. into ENGLISH from Izvestiya Akademii Nauk SSSR: Fizika Atmosfery I Okeana (Moscow, USSR), v. 21, no. 7, Jul. 1985 p 735-743 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

N86-20905# Joint Publications Research Service, Arlington, Va.
ESTIMATING DENSITY INHOMOGENEITY OF UPPER MANTLE UNDER ATLANTIC OCEAN USING DATA FROM COMPREHENSIVE REGIONAL GEOPHYSICAL RESEARCH Abstract Only
A. V. Ladynin, E. M. Litvinov, and S. P. Mashchenkov *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 25 Transl. into ENGLISH from Geologiya I Geofizika (Novosibirsk, USSR), no. 5, May 1985 p 93-103 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N86-21097*# National Aeronautics and Space Administration, Washington, D.C.
THE HUMAN FACTOR: BIOMEDICINE IN THE MANNED SPACE PROGRAM TO 1980
John A. Pitts 1985 402 p refs *In its* History Series
(Contract NASw-3213)
(NASA-SP-4213; NAS 1.21:4213; LC-85-21526) Avail: SOD HC $23.00 as 033-000-00977-1; NTIS MF A01 CSCL 05E

The purpose of this publication is to provide NASA personnel, NASA managers, and the biomedical and historical research communities a well-documented, historical summary of the content and organization of NASA's biomedical programs from Project Mercury up to the Shuttle program. The publication includes not only a major narrative portion, but appendixes and reference notes. Author

N86-21098# Michigan Univ., Ann Arbor. Dept. of Physiology.
CIRCADIAN VARIATION IN HOST DEFENSE Annual Report, Nov. 1984 - Oct. 1985
Matthew J. Kluger 18 Nov. 1985 10 p
(Contract N00014-85-K-0027; RR0-4108)
(AD-A161702) Avail: NTIS HC A02/MF A01 CSCL 06/15

We have been monitoring the body temperature and relative activity of up to 24 rats at a time using a recently developed biotelemetry system (The Dataquest III; Mini-Mitter Company). Each cage is maintained in a constant temperature chamber at 27 C and is on a 12:12 hour light-dark cycle. In the process of testing the versatility of this system and obtaining pilot data we have generated data for two manuscripts: (1) Hyperthermia induced by open-field stress is blocked by salicylate, Physiology and Behavior, and (2) Selection of cage size by Sprague-Dawley rats. Data directly relevant to the ultimate goal of the research include the following: a. We have established a dose of sodium salicylate which will block the circadian rise in body temperature, and b. We have established the normal circadian variation in activity for rats maintained on a 12:12 light-dark cycle. The administration of an antipyretic dose of sodium salicylate to rats in the late afternoon resulted in significant attenuation of the rise in body temperature normally observed at night; the drug had no effect on activity. Administration of this same dose of sodium salicylate to rats during the morning hours had no effect on body temperature or on activity. Since antipyretic drugs are thought to act by returning an elevated thermoregulatory set-point to normal, these data suggest to us that the rise in temperature observed at night in rats is a true fever, perhaps induced by interleukin-1 (IL-1). GRA

N86-21099# Georgia Univ., Athens.
ROLE OF Ca(2+)/CALMODULIN IN PHOSPHORYLATION OF PROTEINS IN PLANTS Final Report, 1 Aug. 1983 - 31 Jul. 1985
M. J. Cormier 1985 11 p refs
(Contract DE-AS09-83ER-13107)
(DE86-001804; DOE/ER-13107/3) Avail: NTIS HC A02/MF A01

In order to elucidate the role of Ca(2+)-dependent protein phosphorylation in plant cell function, a Ca(2+)-dependent protein kinase from suspension-cultured soybean cells has been partially

purified and characterized. It was previously shown that crude extracts of the soybean cells contain soluble protein kinase(s) that preferentially phosphorylates at least eight endogenous proteins in vitro in the presence of 0.5 mM CaCl2. An assay based on phosphorylation of the artificial substrate histone H1 has been devised. DOE

N86-21100# Los Alamos National Lab., N. Mex.
NEW ROLES FOR COMPUTATION IN THE LIFE SCIENCES
G. I. Bell 1985 13 p refs Presented at the Computer Analysis for Life Science, Okayama, Japan, 9 Jul. 1985
(Contract W-7405-eng-36)
(DE85-017542; LA-UR-85-2985; CONF-850784-2) Avail: NTIS HC A02/MF A01

Important new roles for computation in the life sciences are being found in the study of the linear polymers DNA, RNA, and proteins, and in the correlation of the sequence with the structure and function of each. Because of the ease with which DNA sequences can be determined and the definitive and often surprising information contained in the sequences, an explosion of biological information is taking place that will increasingly rely on computers for its analysis and understanding. DOE

N86-21101# Brookhaven National Lab., Upton, N. Y.
EXPERIMENTAL, STRUCTURAL AND THEORETICAL MODELS OF BACTERIOCHLOROPHYLLS a, d AND g
J. Fajer, K. M. Barkigia, E. Fujita, D. A. Goff, L. K. Hanson, J. D. Head, T. Horning, K. M. Smith, and M. C. Zerner 1985 17 p refs Prepared in cooperation with California Univ., Davis, and Florida Univ., Gainesville
(Contract DE-AC02-76CH-00016)
(DE86-001727; BNL-36992) Avail: NTIS HC A02/MF A01

The model studies presented here probe possible effects that the protein environment may induce or impose on the conformation and electronic configuration of photosynthetic chromophores. Results are presented for the effect of axial ligation and hydrogen bonding on the electron spin resonance properties of bacteriopheophytin and bacteriochlorophyll a cation radicals. X-ray diffraction results on single crystals illustrate the significant conformational changes that different crystal habits enforce on the same skeleton of bacteriopheophytins d and the structural consequences of oxidation on a magnesium porphyrin. Theoretical calculations are also described that predict spectral and redox properties of bacteriochlorophyll g, the recently discovered chromophore of the anoxygenic bacterium, heliobacterium chlorum. DOE

N86-21102# Pacific Northwest Lab., Richland, Wash.
COMPARATIVE ANALYSIS OF BIOMASS PYROLYSIS CONDENSATES
D. C. Elliott Sep. 1985 38 p refs Presented at the Health and Environmental Research on Complex Organic Mixtures, Richland, Wash., 21 Oct. 1985
(Contract DE-AC06-76RL-01830)
(DE86-001773; PNL-SA-13158; CONF-851027-2) Avail: NTIS HC A03/MF A01

The purpose of this research is to determine the chemical composition, physical properties, and biological activity of biomass gasification/pyrolysis tars and condensates. The analytical results show conclusively that all biomass derived tars and condensates are not the same. There is no typical tar composition that can be adequately used. It is dependent on the operating conditions, principally a time/temperature thermal severity-type function. Results show high biological activity (Ames assay) only in high-temperature processed tars. Mutagenic activity in gasification condensates is correlated with the concentration of polycyclic aromatic hydrocarbons in the same. Based on the above information, a potential processing dilemma has now been identified. Higher temperatures are generally perceived to improve the efficiency and rate of gasification. In addition, our data also suggests that less contamination will remain in the aqueous byproduct stream when the gasification is performed at higher temperature. On the other hand, the tar components that do remain following higher temperature processing contain more highly condensed PAH which result in a higher level of mutagenic activity. The transformation from phenolic to PAH is strongly a function of temperature in the range of 700(0) to 950(0)C. Therefore consideration of the processing requirements for the aqueous condensate stream versus the organic condensate stream may become critical with operating temperature being the major independent variable. DOE

N86-20444# Joint Publications Research Service, Arlington, Va.
SHKLOVSKIY DISCUSSES POSSIBILITY OF EXTRATERRESTRIAL INTELLIGENCE
I. S. Shklovskiy *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 39-44 Transl. into ENGLISH from Zemlya I Vselennaya (Moscow, USSR), no. 3, May - Jun. 1985 p 76-80 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

N86-20445# Joint Publications Research Service, Arlington, Va.
SALYUT-7 ELECTROPHORESIS EXPERIMENTS AID MEDICAL RESEARCH
T. Chesanova *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 45 Transl. into ENGLISH from Leningradskaya Pravda (Leningrad, USSR), 13 Oct. 1985 p 2 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

N86-20690# Joint Publications Research Service, Arlington, Va.
METEOROLOGICAL ADAPTATION RESEARCH AT BIOLOGY INSTITUTE Abstract Only
Ye. Krushelnitskiy *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 5-6 Transl. into ENGLISH from Trud (Moscow, USSR), 26 Sep. 1985 p 3 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

N86-21132# Joint Publications Research Service, Arlington, Va.
GREENHOUSES WITH CURVILINEAR PLANTING SURFACE
Yu. A. Berkovich, V. A. Korbut, and V. I. Pavlovskiy *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) 19 Feb. 1986 p 115-119 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 77-80 (For primary document see N86-21114 11-52)
Avail: NTIS HC A08/MF A01

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N86-21103 New South Wales Univ., Kensington (Australia). Centre for Biomedical Engineering.
ANALYSIS TECHNIQUES FOR CONTINUOUS TWENTY FOUR HOUR AMBULATORY BLOOD PRESSURE PATTERNS Abstract Only
David John Roffe 1985 3 p
Avail: Issuing Activity

The Oxfor ambulatory blood pressure recording system records each arterial blood pressure complex during a 24 hour period onto a miniature cassette tape. A hierarchy of analysis techniques was developed on a DEC LSI-11/03 minicomputer. Subsequent statistical analysis and graphical representation describe the patient's arterial blood pressure variation throughout the recording period. Inspection of 24 hour continuous ambulatory blood pressure record shows many marked, apparently spontaneous blood pressure fluctuations. Detection of these blood pressure transients as they occur may help sort out their causal mechanisms. A microprocessor device was constructed to monitor direct blood pressure in real time and compile a history of the blood pressure and heart rate. E.A.K.

N86-21104 Central Electricity Generating Board, London (England).
THE EFFECT OF EQUALLY EFFECTIVE NEUTRON AND X-RAY RADIATION DOSES ON THE EPITHELIAL CELLS OF THE HAIR BULB
S. M. Valter, E. L. Ginsburg, A. V. Bogatyrev, G. I. Kalonykova, and A. G. Sverdlov 6 Nov. 1985 13 p refs Transl. into ENGLISH from Radiobiologia (USSR), v. 22, issue 5, 1982 p 637-642
(BLL-CE-Trans-8221-(9022.090)) Avail: British Library Lending Div., Boston Spa, Engl.

Two stages in the response of rat hair follicle cells to X-ray and neutron irradiation with equally effective doses were examined. Enlargement of endoplasmic reticulum canals, swelling of some of the mitochondria, and appearance of autophagous vacuoles in cells were detected during the first day following irradiation. After 5 to 7 days, the changes which occurred were characteristic of the process of hair follicle transfer from the active to resting stage. No qualitative distinctions are detected in the radiation response of the cells studied. E.A.K.

N86-21105*# Baylor Coll. of Medicine, Houston, Tex. Dept. of Medicine.
IN VIVO NUCLEAR MAGNETIC RESONANCE IMAGING Final Report, Oct. 1984
Adrian LeBlanc, Harlan Evans, R. Nick Bryan, Phillip Johnson, Ernie Schonfeld, and Satish G. Jhingran Oct. 1984 25 p refs
(Contract NAS9-16442)
(NASA-CR-171928; NAS 1.26:171928) Avail: NTIS HC A02/MF A01 CSCL 06P

A number of physiological changes have been demonstrated in bone, muscle and blood after exposure of humans and animals to microgravity. Determining mechanisms and the development of effective countermeasures for long duration space missions is an important NASA goal. The advent of tomographic nuclear magnetic resonance imaging (NMR or MRI) gives NASA a way to greatly extend early studies of this phenomena in ways not previously possible; NMR is also noninvasive and safe. NMR provides both superb anatomical images for volume assessments of individual organs and quantification of chemical/physical changes induced in the examined tissues. The feasibility of NMR as a tool for human physiological research as it is affected by microgravity is demonstrated. The animal studies employed the rear limb suspended rat as a model of mucle atrophy that results from microgravity. And bedrest of normal male subjects was used to simulate the effects of microgravity on bone and muscle. Author

N86-21106*# Nevada Univ., Reno. Fast Motion Perception Lab.
CONTRIBUTIONS TO WORKLOAD OF ROTATIONAL OPTICAL TRANSFORMATIONS Final Technical Report
Rick Paul Atkinson and Thomas L. Harrington [1985] 123 p refs
(Contract NCC2-272)
(NASA-CR-176542; NAS 1.26:176542) Avail: NTIS HC A06/MF A01 CSCL 06S

An investigation of visuomotor adaptation to optical rotation and optical inversion was conducted. Experiment 1 examined the visuomotor adaptability of subjects to an optically rotating visual world with a univariate repeated measures design. Experiment 1A tested one major prediction of a model of adaptation put forth by Welch who predicted that the aversive drive state that triggers adaptation would be habituated to fairly rapidly. Experiment 2 was conducted to investigate the role of motor activity in adaptation to optical rotation. Specifically, this experiment contrasted the reafference hypothesis and the proprioceptive change hypothesis. Experiment 3 examined the role of cognition, error-corrective feedback, and proprioceptive and/or reafferent feedback in visuomotor adaptation to optical inversion. Implications for research and implications for practice were suggested for all experiments. Author

N86-21107*# San Francisco State Univ., Calif.
STIMULUS SPECIFICITY AND INDIVIDUAL STEREOTYPY OF AUTONOMIC RESPONSES TO MOTION STRESSORS M.S. Thesis
Maxwell Guy Morgan Aug. 1985 54 p refs
(Contract NCC2-115)
(NASA-CR-176543; NAS 1.26:176543) Avail: NTIS HC A04/MF A01 CSCL 06S

Motion sickness research shows a lack of agreement regarding the contribution of the autonomic nervous system (ANS). The resolution of this question is exigent for Space Adaptation Syndrome, zero gravity sickness. A case is drawn for the necessity to apply a methodological approach that incorporates: (1) standardization of parameters in relation to the individual differences in variability and prestimulus levels; (2) a concern for patterning of responses; and (3) the physiological association with subjective reports. Vasomotor, heart rate, respiration rate, skin conductance and subjective reports of malaise were collected from 22 subjects while participating in three motion stressors; vertical acceleration, Coriolis stimulation, and combined optokinetic and Coriolis stimulation. The results demonstrate that ANS response patterns can be separated into three mutually exclusive components: (1) a generalized response to motion sickness; (2) a stimulus specific response to the type of stressor being presented; and (3) individualized stereotypical response patterns that are associated with subjective reports of malaise. Author

N86-21108*# California Univ., San Francisco. Contract NCC2-115
EXPLORATORY STUDIES OF PHYSIOLOGICAL COMPONENTS OF MOTION SICKNESS: CARDIOPULMONARY DIFFERENCES BETWEEN HIGH AND LOW SUSCEPTIBLES Progress Report
Karen Naifeh [1985] 18 p refs
(NASA-CR-176541; NAS 1.26:176541) Avail: NTIS HC A02/MF A01 CSCL 06S

A comprehensive examination of cardiovascular autonomic response to motion sickness was studied and whether differences in cardiopulmonary function exist in high and low susceptibility groups were determined. Measurement techniques were developed as was test equipment for its ability to provide accurately new measures of interest and to test the adequately of these new measures in differentiating between susceptibility groups. It was concluded that these groups can be differentiated using simple, brief stressors and measurements of cardiodynamic function. Author

N86-21109*# California Univ., San Francisco.
SHUTTLE FLIGHT EXPERIMENT 30-DAY SUMMARY REPORT
1985 25 p
(Contract NCC2-115)
(NASA-CR-176539; NAS 1.26:176539) Avail: NTIS HC A02/MF A01 CSCL 06S

A total of 12 AFT training sessions were administered to SL 3 Payload Specialists over a 7 month period. Nine of these sessions were 2 hours in duration and three were 3 hours in duration. A total of three rotating chair tests were conducted in this time frame with four subjects. The performance of these crewmen across tests is shown. Test 1, a baseline motion sickness test, was conducted approximately 10 months prior to the mission, before any AFT was administered. Test 2 was administered after 2 hours of AFT, test 3 after 4 hours and test 4 after 6 hours (total) of training in symptom control. Improvement in performance is reflected by a subject's ability to tolerate a greater number of rotations across tests. Additional training for crewman was not possible within the constraints of the mission. Results of the mission indicate that, as predicted preflight, subject #32 was relatively symptom free inflight while subject #33 was not. Other preflight and postflight tests and analyses are reported. Author

N86-21110# Office of Naval Research, London (England).
THE 10TH MEETING OF THE INTERNATIONAL SOCIETY FOR NEUROCHEMISTRY HELD AT RIVA DEL GARDA, ITALY ON 19-24 MAY 1985
C. E. Zomzely-Neurath 8 Oct. 1985 12 p Meeting held at Riva del Garda, Italy, 19-24 May 1985
(AD-A160668; ONRL-C-10-85) Avail: NTIS HC A02/MF A01

CSCL 06/1

The Tenth Meeting of the International Society for Neurochemistry was held in Riva del Garda, Italy, from 19 through 24 May 1985. This report discusses presentations on molecular neurobiology, post-translational modification, neurotransmitter receptors, neuropeptide processing, and specific macromolecules in cell-cell interactions in the nervous system. Author (GRA)

N86-21111# Army Research Inst. of Environmental Medicine, Natick, Mass.

COMPARISON OF MALE AND FEMALE MAXIMUM LIFTING CAPACITY

M. A. Teves, J. A. Vogel, and J. E. Wright Sep. 1985 15 p
(AD-A160687; USARIEM-M40/85) Avail: NTIS HC A02/MF A01
CSCL 06/19

A large influx of women into traditionally male fields of employment has drawn much attention to the strength differences between men and women. Two tests of isometric strength (handgrip and upright pull) and two tests of maximum lift capacity (a weight lift machine-IDL 152 and a weighted box lift MLC 132) were administered to 90 male and 107 female soldiers at the end of their Basic Training in order to examine differences in female/male (F/M) strength ratio. Skinfold measurements were made to obtain an estimate of lean body mass (LBM). Females exhibited 63% of the isometric strength and 55-59% of the lifting capacity of males. When the scores were normalized for body weight (BW) females were 75% as strong as males on isometric measures, and were able to lift 66% as much on IDL 152 and 72% as much on MLC 132. Comparison of the two lifting tasks revealed that on the average, males were able to lift 18% more weight and 24% more weight on the free lift than on the machine lift. This would suggest that if a machine lift is used for pre-employment screening purposes, the absolute weight an applicant is required to lift on the machine need not equal the maximum weight to be lifted on the job. As the difference between a machine lift and a free lift task was greater in females, a machine lift test may pose a greater disadvantage to female candidates than would isometric or free weight lift testing. GRA

N86-21112# Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.

HEAD-SPINE STRUCTURE MODELING: ENHANCEMENTS TO SECONDARY LOADING PATH MODEL AND VALIDATION OF HEAD-CERVICAL SPINE MODEL Final Technical Report, May 1980 - May 1984

T. Belytschko, M. Rencis, and J. Williams Jul. 1985 132 p
(Contract F33615-80-C-0523)
(AD-A161425; AAMRL-TR-85-019) Avail: NTIS HC A07/MF A01
CSCL 06/19

SAM (for Structural Analysis of Man) is a three-dimensional discrete element mathematical model developed for the prediction of the dynamic response of the head-spine-torso structure to severe impact environments. The model mathematically describes the equations of motion for a system of rigid bodies representing, for example, the head, torso segments and the pelvis, interconnected by deformable elements representing, for example, the intervertebral discs, ligaments and other connective tissues. SAM consists of two distinct components; a general purpose, large displacement, dynamic structural analysis program and a data base containing a number of data sets each which contains material, geometric and inertial property, connectivity and loading environment data. This report describes: the development of a model of the diaphragm which, when incorporated into the HSM, will significantly enhance its ability to replicate the effects of the secondary +Gz loading path through the viscera-abdominal wall/diaphragm/rib-cage system; a discussion of spinal injuries associated with pilot ejection and proposed injury criteria for the cervical spine; an axisymmetric finite element analysis of a lumbar vertebral body with comparisons to other models and specific attention to the question of material distribution effects on stresses; and frontal (-Gx) and lateral (+Gy) impact simulations using the recently developed Head-Cervical Spine Model and comparisons of simulation results with experimental data. GRA

N86-21113# Monsanto Research Corp., Miamisburg, Ohio. Mound.

LIGHT-WEIGHT RADIOISOTOPE HEATER UNIT SAFETY ANALYSIS REPORT (LWRHU-SAR). VOLUME 1. A. INTRODUCTION AND EXECUTIVE SUMMARY. B. REFERENCE DESIGN DOCUMENT (RDD)

E. W. Johnson Oct. 1985 96 p
(Contract DE-AC04-76DP-00053)
(DE86-001457; MLM-3293-Vol-1) Avail: NTIS HC A05/MF A01

The orbiter and probe portions of the NASA Galileo spacecraft contain components which require auxiliary heat during the mission. To meet these needs, the Department of Energy's (DOE's) Office of Special Nuclear Projects (OSNP) has sponsored the design, fabrication, and testing of a one-watt encapsulated plutonium dioxide-fueled thermal heater named the Light-Weight Radioisotope Heater Unit (LWRHU). This report addresses the radiological risks which might be encountered by people both at the launch area and worldwide should postulate mission failures or malfunctions occur, which would result in the release of the LWRHUs to the environment. Included are data from the design, mission descriptions, postulated accidents with their consequences, test data, and the derived source terms and personnel exposures for the various events. DOE

N86-21114# Joint Publications Research Service, Arlington, Va.

USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 19, NO. 6, NOVEMBER - DECEMBER 1985

O. G. Gazenko, ed. 19 Feb. 1986 154 p refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 95 p
(JPRS-USB-86-001) Avail: NTIS HC A08/MF A01

Reports of U.S.S.R. researach in space biology and aerospace medicine are presented. Orthostatic tolerance under various conditions in humans and animals was an important topic of interest. Weightless effects on muscular function in animals and humans were also investigated. Studies were also carried out on the physiological effect of high altitude on the cardiovascular system and the brain. For individual titles, see N86-21115 through N86-21137.

N86-21115# Joint Publications Research Service, Arlington, Va.

SPATIAL ILLUSIONS OF VESTIBULAR GENESIS DURING FLIGHTS IN AIRCRAFT

E. V. Lapayev and O. A. Vorobyev *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) 19 Feb. 1986 p 11-16 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 11-15 (For primary document see N86-21114 11-52)
Avail: NTIS HC A08/MF A01

Vestibular illusions (incidence, pattern, manifestation, negative effect on pilot's activity) that occur in the atmospheric flight were studied. A special questionnaire was used to interview anonymously 484 flying crewmembers. Spatial illusions were detected in 71.1% of the crewmembers; they developed in 50.6% when turns were performed and they were perceived in 76.2% as a false bank. Over 50% (54.3%) of the crewmembers interviewed reported that spatial illusions adversely affected pilot's performance and 3.6% of them indicated that they adversely influenced the flight program as a whole. Spatial illusions can be generated by various factors which should be taken into account in order to improve countermeasures against spatial illusions in the flying personnel. Author

N86-21116# Joint Publications Research Service, Arlington, Va.

VESTIBULAR FUNCTION IN OLDER INDIVIDUALS SUBMITTED TO ANTIORTHOSTATIC HYPOKINESIA FOR 30 DAYS

V. K. Gavrilin and L. N. Zakharova *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) 19 Feb. 1986 p 17-25 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6,

Nov. - Dec. 1985 p 15-20 (For primary document see N86-21114 11-52)
Avail: NTIS HC A08/MF A01

Vestibular responses of 15 men (aged 42 to 50) to 30-day head-down tilt (-8 deg) were investigated. The test subjects showed atherosclerotic symptoms and neurocirculatory dystonia of the hypertensive type. They were exposed to the Fitzgerald-Hallpike caloric test, indirect otolithometry (eye counter-rolling reflex according to the method of successively presented images), and motion sickness according to Bryanov. In the pretest period vestibular changes were seen at the level of labyrinths and central formations (change in the nystagmic pattern, dissociation of the components of the caloric reaction, vestibular asymmetry, negative counter-rolling). During head-down tilt cupular reflexes remained essentially unaltered, except for the asymmetry and enhancement of the sensory and autonomic components of the caloric reaction. The otolith function was modified in all the test subjects. After exposure tolerance to motion sickness was not deteriorated.
Author

N86-21117# Joint Publications Research Service, Arlington, Va.
CHARACTERISTICS OF ACCELERATIONS IN AEROBATIC FLIGHT AS A SPORT
V. G. Voloshin, Yu. I. Bykova, A. V. Opryshko, and N. A. Lapshina *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) 19 Feb. 1986 p 26-28 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 20-22 (For primary document see N86-21114 11-52)
Avail: NTIS HC A08/MF A01

Thirty well-qualified flying sportsmen, aged 22 to 42, who performed 210 aerobatic flights, onboard a sporting airplane Yak-50, were examined, using an automatic monitoring system. The flyers were exposed to +9 Gz and -6 Gz as a maximum the duration of which was 10 s and 5 s, respectively. The onset rate varied from 0.5 to 2.5 G/s (with the mean rate 1 G/s), reaching 4.2 G/s as a maximum. On the average, the training flight lasts 25 min, 45 to 50% of which the pilot experiences acceleration of various values and different sign. The most common acceleration values are: +6 and +7 Gz or -4 and -5 Gz. Author

N86-21118# Joint Publications Research Service, Arlington, Va.
DISTINCTIONS IN REACTIONS TO ACTIVE ORTHOSTATIC AND WATER-LOADING TESTS OF SUBJECTS DIFFERING IN TOLERANCE TO POSITIVE Gz ACCELERATIONS
I. G. Dlusskaya and M. N. Khomenko *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) 19 Feb. 1986 p 29-35 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 22-27 (For primary document see N86-21114 11-52)
Avail: NTIS HC A08/MF A01

Thirty-seven healthy male test subjects, aged 19 to 21, with different +Gz acceleration tolerance were examined. Their blood pressure (BP) and heart rate (HR) during 5-min tilt tests and 2% water loading tests were measured 2 to 3 weeks prior to centrifugation. Quantitative evaluation of orthostatic tolerance using an orthostatic index and BP and HR responses to tilt tests before and after water loading revealed specific features of cardiovascular regulation in the subjects with high and low +G acceleration tolerance. The negative predictive indicators include: decreased BP, HR and cardiac index in the supine position in combination with high orthostatic tolerance, as well as decreased orthostatic tolerance in combination with a lower function of vasoconstrictor mechanisms in the upright position and a lower sensitivity of carotid sinus reflexes to blood volume changes during tilt and water loading tests. Author

N86-21119# Joint Publications Research Service, Arlington, Va.
EFFECT OF IMMERSION HYPOKINESIA ON CHARACTERISTICS OF PROGRAMMED VOLUNTARY MOVEMENTS
A. V. Kirenskaya, I. B. Kozlovskaya, and M. G. Sirota *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) 19 Feb. 1986 p 36-43 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 27-32 (For primary document see N86-21114 11-52)
Avail: NTIS HC A08/MF A01

The effect of immersion hypokinesia on the precision of program-type voluntary movements was investigated using standard test movements and quanitative analytical methods. The exposure did not cause disorders in the programme mechanisms but reduced significantly the precision range of the motor control system. The loss of precision was at its maximum (by 100% and over) on immersion day 3. The universality and consistency of the above changes indicated their close association with the specific exposure while the fast rate of their development suggested their reflex nature. Author

N86-21120# Joint Publications Research Service, Arlington, Va.
CEREBRAL CIRCULATION AND OXYGENATION IN HEALTHY MAN DURING GRADED EXERCISE IN ANTIORTHOSTATIC POSITION
V. Ye. Katkov and N. V. Pravetskiy *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) 19 Feb. 1986 p 44-47 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 32-34 (For primary document see N86-21114 11-52)
Avail: NTIS HC A08/MF A01

Eleven healthy male test subjects performed exercises of 600 kgm/min (98 W) for 20 min in the head-down position (-15 deg). A day before exercises they were catheterized, with catheters implanted into the internal jugular vein and brachial artery. It was shown that exercises in the head-down position an increase in cerebral circulation, a decrease in oxygen utilization and a decrease in jugular pressure. CO2 tension in arterial blood and blood outflowing from the brain remained comparatively stable, while base deficiency and buffer capacity decreased by a similar value.
Author

N86-21121# Joint Publications Research Service, Arlington, Va.
FORCED EXPIRATION PARAMETERS IN HEALTHY MAN SUBMITTED TO SIMULATED WEIGHTLESSNESS
N. M. Asyamolova, V. G. Shabelnikov, V. M. Baranov, A. N. Kotov, and M. Yu. Volkov *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) 19 Feb. 1986 p 48-52 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 34-37 (For primary document see N86-21114 11-52)
Avail: NTIS HC A08/MF A01

Lung volumes and forced expiratory volumes during 3-hour water immersion as well as in the upright and supine positions were measured. Water immersion up to the neck decreased the functional residual capacity, peak and maximum velocities of air flows during inspiration and expiration with various lung volumes and increased the forced expiratory time and pulmonary time constant. These changes seem to be produced by a higher inelastic resistance as well as additional hydrostatic pressure upon the chest and abdomen. During the transfer from the upright to the supine position these changes were identical but of smaller magnitude. Author

N86-21122# Joint Publications Research Service, Arlington, Va.
EFFECT OF RESTRICTED MOTOR ACTIVITY ON ALANINE LEVEL IN HUMAN PLASMA
T. F. Vlasova, Ye. B. Miroshnikova, and A. S. Ushakov *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) 19 Feb. 1986 p 53-57 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 37-40 (For primary document

see N86-21114 11-52)
Avail: NTIS HC A08/MF A01

The plasma alanine concentration was measured in 28 healthy male test subjects exposed to head-down tilt of various duration (2-hour exposure at -12 deg, 7-day exposure at -6 deg, 49-day exposure at -4 deg, and 120-day exposure at -4 deg). Head-down tilt led to alanine changes that correlated with exposure time. These results suggest that alanine concentrations in blood reflect to a certain extent the rate of hepatic gluconeogenesis and depend significantly on the hypokinetic time. The findings can be clinically used as a measure of hepatic gluconeogenesis in bed-ridden patients that may require preventive or therapeutic treatment.
Author

N86-21123# Joint Publications Research Service, Arlington, Va.
EFFECT OF WEIGHTLESSNESS AND SOME OF ITS MODELS ON MECHANICAL PROPERTIES OF ANIMAL BONES SUBMITTED TO TORSION
M. A. Dobelis, Yu. Zh. Saulgozis, V. Ye. Novikov, Ye. A. Ilin, and V. S. Oganov *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) 19 Feb. 1986 p 58-65 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 40-45 (For primary document see N86-21114 11-52)
Avail: NTIS HC A08/MF A01

Mechanical properties (stress and strain) of bones from rats of different ages exposed to weightlessness, hypodynamia or hypokinesia were examined upon torsion. As compared to the controls, the femur of Cosmos-1129 rats showed high deformability. Also, skeletal bones of young rats proved more sensitive to hypodynamia than those of adult animals.
Author

N86-21124# Joint Publications Research Service, Arlington, Va.
ROLE OF VITAMIN D3 ACTIVE METABOLITES IN REGULATION OF CALCIUM METABOLISM IN HYPOKINETIC RATS
I. N. Sergeyev, B. V. Afonin, N. V. Blazheyevich, B. V. Morukov, and M. S. Belakovskiy *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) 19 Feb. 1986 p 66-71 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 46-50 (For primary document see N86-21114 11-52)
Avail: NTIS HC A08/MF A01

The rats exposed to prolonged hypokinesia showed hypocalcemia, lower PTH and higher calcitonin concentrations in the serum, decreased calcium absorption in the small intestine, and a trend toward nephro- and arteriocalcinosia. Prophylactic administration of 24,25-hydroxy D sub 3, 1,25-hydroxy D sub 3 and their combinations enhanced calcium absorption and alleviated hypocalcemia. The changes in the hormonal regulation of calcium homeostasis can be viewed as a factor responsible for calcium metabolic disorders associated with hypokinesia.
Author

N86-21125# Joint Publications Research Service, Arlington, Va.
COMPARISON OF BONE REACTIONS OF RATS SUBMITTED TO CLINOSTATIC AND ANTIORTHOSTATIC HYPOKINESIA
V. N. Shvets, A. S. Pankova, O. Ye. Kabitskaya, and Z. Ye. Vnukova *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) 19 Feb. 1986 p 72-78 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 50-54 (For primary document see N86-21114 11-52)
Avail: NTIS HC A08/MF A01

Examination of spongy bones of rats exposed to clino- and antiorthostatic hypokinesia showed that changes in bone mass, bone cells and their precursors were similar in both cases. The bone resorption-bone formation process remained balanced. However, bone responses to clino- and antiorthostatic hypokinesia exhibited certain differences. Clinostatic hypokinesia produced greater osteo-porosis in the femoral bone, whereas bone losses in the humerus, sternum and pelvis were identical. Antiorthostatic hypokinesia led to osteoporosis that was identical in every bone examined. In addition, clino- and antiorthostatic hypokinesia caused different reactions of stromal precursor cells, the latter model producing a greater effect on them. It is concluded that immobilization-induced skeletal disorders are associated with a decreased rate of bone histogenesis which proceeds at a lower level rather than with the stress-reaction.
Author

N86-21126# Joint Publications Research Service, Arlington, Va.
CONDITION OF THYROID GLAND AND C CELLS DURING LONG-TERM ROTATION (MORPHOLOGICAL AND BIOCHEMICAL INVESTIGATION)
G. I. Plakhuta-Plakutina, Ye. A. Savina, and B. V. Afonin *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) 19 Feb. 1986 p 79-83 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 54-57 (For primary document see N86-21114 11-52)
Avail: NTIS HC A08/MF A01

The thyroid and parathyroid glands of 65 Wistar rats centrifuged for 30 days at 1.1 and 2.0 G were examined histologically and biochemically. The centrifugation led to a higher activity to C cells, an increased rate of thyro-calcitonin (TCT) synthesis and excretion, i.e., C-cell degranulation, and a significant (twofold) increase of TCT in plasma. The stimulation effect of the TCT-producing system persisted during 7-postrotation days and was very distinct in the animals exposed to 2.0 G. There were no morphological changes in the parathyroid glands or in the PTH concentration in the plasma.
Author

N86-21127# Joint Publications Research Service, Arlington, Va.
CONDITION OF CARDIOVASCULAR SYSTEM IN PRESENCE OF ACUTE MOUNTAIN SICKNESS
M. M. Mirrakhimov, R. O. Khamzamulin, and V. A. Larkov *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) 19 Feb. 1986 p 84-90 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 57-62 (For primary document see N86-21114 11-52)
Avail: NTIS HC A08/MF A01

Fifteen subjects with uneventful adaptation and 28 subjects with acute high mountain sickness were kept at an altitude of 3600 m. Prior to the exposure all the test subjects, aged 18 to 20, were essentially healthy. As compared to the controls, the subjects with acute high mountain sickness showed a greater increment in heart rate, blood pressure in the brachial artery, pulmonary hypertension and vasoconstriction. It was found that the subjects susceptible to acute high mountain sickness exhibited (at sea level) higher values of heart rate and R wave in the ECG II lead and lower systolic pressure in the brachial artery. These findings can serve as predictors of acute high mountain sickness.
Author

N86-21128# Joint Publications Research Service, Arlington, Va.
RAT BRAIN IMPEDANCE IN STATIONARY MAGNETIC FIELD
L. D. Klimovskaya, N. P. Smirnova, and A. S. Dyakonov *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) 19 Feb. 1986 p 91-94 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 62-64 (For primary document see N86-21114 11-52)
Avail: NTIS HC A08/MF A01

The cortical impedance of the large hemispheres of nembutal-anesthetized rats exposed to a constant magnetic field of 0.1, 0.4 and 1.6 T was investigated. During 20 min. exposure the impedance decreased (at the expense of a decrease in both of its components--capacity and active resistance). The impedance decrease was more pronounced (up to 93%) and statistically significant in a field of 1.6 T. After exposure the impedance decrease persisted for 10 min.
Author

N86-21129# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL ARRHYTHMIA AND ITS PREVENTION
L. L. Stazhadze, T. A. Ventslavskaya, and V. V. Korzhova *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) 19 Feb. 1986 p 95-101 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 64-68 (For primary document see N86-21114 11-52)
Avail: NTIS HC A08/MF A01

The preventive antiarrhythmic effect of a new derivative of selene-containing aralkyl amines, i.e., selenophene-24, was compared with the routinely used drugs--novocain amide, isoptin and inderal. With respect to the preventive effect and spectrum of action selenophene-24 was shown to be advantageous on various experimental models of arrhythmias: aconitium, strophantinum, pituitrinum or calcium chloride. Author

N86-21130# Joint Publications Research Service, Arlington, Va.
EVALUATION OF CONDITION OF HUMAN SKIN IN A CLOSED ENVIRONMENT BY MEANS OF CHROMATOGRAPHY
D. M. Dubinin, V. P. Naydina, and S. N. Zaloguyev *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) 19 Feb. 1986 p 102-108 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 69-73 (For primary document see N86-21114 11-52)
Avail: NTIS HC A08/MF A01

Gas-liquid chromatography was used to study the skin and sebum cutaneum of 6 male test subjects (aged 45 to 55) before and after 30-day enclosure. The greatest changes were seen in the composition of free fatty acids of lipids of the facial skin (increase of palmito-oleic acid). The lipid composition of the sebum cutaneum of the healthy subjects differed from that of the acne-bearing subjects. It is recommended to use the ratio of palmitic acid to palmito-oleic acid as a measure of changes of fatty acids in the sebum cutaneum of healthy people in an unusual environment. Author

N86-21131# Joint Publications Research Service, Arlington, Va.
TOXICOLOGICAL EVALUATION OF GAS EMISSION FROM HEAT-STABLE TETRAFLUOROETHYLENE-BASED POLYMERS WHEN HEATED
V. F. Ushakov, G. I. Solomin, G. P. Tikhonova, A. I. Gorshunova, I. I. Lyubarskaya, L. V. Marchenko, E. I. Chukhno, N. Ye. Ostasheva, Ye. A. Demchenko, and S. S. Pashin *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) 19 Feb. 1986 p 109-114 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 73-77 (For primary document see N86-21114 11-52)
Avail: NTIS HC A08/MF A01

The purpose of this study was to investigate the composition and toxicity of fluoroplastic F-40 thermodestruction products at 300 to 500 C and to identify the maximally allowable temperature for their safe use. When heated over 400 C, the products of fluoroplastic F-40 evolution included such compounds as hydrogen fluoride, fluoroorganic compounds, carbon monoxide, formaldehyde. When heated at 500 C, the thermodestruction products caused the highest mortality rate of mice. The pathogenesis and clinical development of fluoroplastic F-40 poisoning are primarily associated with fluoro-compounds. It is concluded that the temperature 300 C is the maximum temperature at which tetrafluoroethylene based polymers can be used. Author

N86-21132# Joint Publications Research Service, Arlington, Va.
GREENHOUSES WITH CURVILINEAR PLANTING SURFACE **c51**
Yu. A. Berkovich, V. A. Korbut, and V. I. Pavlovskiy *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) 19 Feb. 1986 p 115-119 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 77-80 (For primary document see N86-21114 11-52)
Avail: NTIS HC A08/MF A01

The laws of light distribution in plants shown on the flat plane, spherical or cylindrical surfaces were investigated. In microgravity where the plants are arranged radially the level of illumination of lower leaf strata is higher on curvilinear than on flat surfaces. This is due to the following: as the plants grow they get separated; also, the concentration of the light flux increases with depth of plants on the curvilinear surfaces. In view of this, a space greenhouse is suggested, the design of which provides high productivity per unit volume and per unit energy of the incident flux of photosynthetically active radiation. Author

N86-21133# Joint Publications Research Service, Arlington, Va.
DEVICE FOR COMBINED STUDY OF VISUAL TRACKING AND VERBAL ACTIVITY
B. A. Karpov and A. I. Pudov *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) 19 Feb. 1986 p 120-123 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 80-82 (For primary document see N86-21114 11-52)
Avail: NTIS HC A08/MF A01

The diverse forms of industrial and research work often require that man combine intensive visual tracking with verbal activity. A pilot or cosmonaut may be compelled to keep attentive watch over relatively mobile reference points, targets and other objects and, at the same time, hold responsible conversations, receive or give orders, receive important information orally, etc. It is necessary to make synchronous records of the subject's eye movements, his speech as well as speech addressed to him for a quantitative evaluation of tracking distinctions associated with a verbal load. An experimental device designed to solve this problem should meet the following conditions: (1) eye movements must be recorded by a rather sensitive method, so that all elements of functional significance to tracking of eye movements in the macro- and microrange (with the exception of tremor) are distinctly recorded, (2) the test signals delivered for tracking must be few in number and standard, typical, and (3) the tracing obtained as a result of the examination must provide a clear idea about the oculomotor and verbal activity of the subject, as well as the speech of individuals with whom he converses. A device for simultaneous and combined recording of two processes in graphic form--eye movements when tracking visual stimuli and concomitant conversation is described. B.W.

N86-21134# Joint Publications Research Service, Arlington, Va.
METHODOLOGICAL PROBLEMS RELATED TO GROUND-BASED TESTING OF TEMPERATURE-CONTROL SYSTEM FOR MANNED SPACECRAFT **c18**
L. B. Strogonova *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) 19 Feb. 1986 p 124-125 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 82-83 (For primary document see N86-21114 11-52)
Avail: NTIS HC A08/MF A01

The temperature-control system (TCS) of manned spacecraft is one of the chief elements of the life-support system that affect the structural features of the craft as a whole. Not only reliable and proper operation of craft instruments, equipment, scientific apparatus, but work capacity of crew members depend on operation of this system. Analysis of data in the literature shows that mathematical modeling with consideration of possible identification or parameters of the mathematical model should fine broad application in the field of experimental development of TSC. Author

N86-21135# Joint Publications Research Service, Arlington, Va.
EFFECT OF ACTIVE ANTIORTHOSTATIC CONDITIONING ON

TOLERANCE TO CRANIAL REDISTRIBUTION OF BLOOD
A. F. Zavadovskiy, M. M. Korotayev, S. V. Kopanev, I. A. Plyasova-Bakunina, and Yu. N. Vavakin *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) 19 Feb. 1986 p 126-129 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 83-85 (For primary document see N86-21114 11-52)
Avail: NTIS HC A08/MF A01

At the present time, antiorthostatic position of the body is used extensively in aerospace medicine as a model for investigation of reactions of the cardiovascular system to gravity-caused redistribution of blood. In particular, one can predict, to some extent, tolerance of the circulatory system to weightlessness, particularly in the acute period of adaptation, by means of the antiorthostatic test an angles of -15 and -30 deg. A distinction is made between active and passive orthostatic tests. In the active form, the subject assumes an antiorthostatic position by himself and voluntary muscular tension is mandatory; in the passive form, the position is usually obtained by means of a turntable. Under these conditions one observes muscular relaxation. The objective here was to investigate the flexibility of regulatory mechanisms of the cardiovascular system and the possibility of enhancing the body's tolerance to gravity-related redistribution of blood by using active antiorthostatic tests. Author

N86-21136# Joint Publications Research Service, Arlington, Va.
SOME ASPECTS OF HUMAN AMINO ACID METABOLISM AT HIGH ALTITUDE
Yu. A. Sinyavskiy, T. F. Vlasova, M. S. Belakovskiy, Yu. A. Senkevich, and B. I. Kim *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) 19 Feb. 1986 p 130-133 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 85-87 (For primary document see N86-21114 11-52)
Avail: NTIS HC A08/MF A01

The problem of adaptation to altitude hypoxia has become particularly timely recently in view of the active economic development of mountainous regions and the need to perform difficult forms of physical and intellectual work at high altitudes. In addition, high-altitude climate is used extensively for prevention and treatment of cardiovascular and pulmonary pathology, as well as for holding training meets for representatives of different sports. But stays at high altitudes and concomitant hypoxial lead to functional changes in different systems of the body, eliciting changes in energy, protein and amino acid metabolism, yet the latter has not been sufficiently investigated. This study was undertaken in order to assess amino acid metabolism as related to hypoxic conditions and physical exercise in top-ranking sport mountain climbers, who were candidates for an expedition to Mount Everest, at the time of their adaptation to high-altitude conditions and after an ascent to more than 4000 m above sea level. Author

N86-21137# Joint Publications Research Service, Arlington, Va.
ELECTROCARDIOGRAM IN NEHB TYPE LEADS OF MACACA MULATTA MONKEYS
V. P. Melnichenko, M. D. Goldovskaya, I. O. Giryayeva, Yu. V. Shevchenko, G. G. Chamurliyev, and V. S. Magedov *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) 19 Feb. 1986 p 134-138 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 87-89 (For primary document see N86-21114 11-52)
Avail: NTIS HC A08/MF A01

Macaca mulatta (rhesus) monkeys are used extensively in model experiments, which reproduce various physiological and pathological states, including cardiovascular diseases [6]. There are a considerable number of publications dealing with the normal electrocardiogram (ECG) of lower primates, including Macaca mulatta, which were recorded in standard and amplified monopolar leads from the extremities. At the same time, when monitoring the heart's bioelectric activity in chronic experiments there are some advantages to using the system of bipolar precardiac leads of Nehb, since it permits recording the ECG when there is a high signal level in several projection planes of the resultant vector of the heart's electromotive force with a minimum of implanted exploring electrodes. However, there is no information in the literature concerning the standard features of the ECG in the Nehb leads for monkeys. The objective here was to examine the ECG distinctions of monkeys as recorded in the leads of Nehb using chronically implanted electrodes. Author

N86-20628# Army Missile Command, Redstone Arsenal, Ala.
EFFECTS OF CARBON MONOXIDE ON PERSONNEL
M. Mossa *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 2 Aug. 1984 p 1309-1341 (For primary document see N86-20623 11-31)
(AD-P004882) Avail: NTIS HC A99/MF E03 CSCL 13/12

N86-20629# Army Materiel Command, Aberdeen Proving Ground, Md.
AN EXAMINATION OF INJURY CRITERIA FOR POTENTIAL APPLICATION TO EXPLOSIVE SAFETY STUDIES
D. N. Neades and R. R. Rudolph *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 2 Aug. 1984 p 1343-1354 (For primary document see N86-20623 11-31)
(AD-P004883) Avail: NTIS HC A99/MF E03 CSCL 13/12

N86-21013 Dortmund Univ. (West Germany). Inst. fuer Arbeitsphysiologie.
NEUROPHYSIOLOGICAL ACTIVITY AND PSYCHOPHYSICAL EFFECTIVENESS OF ENVIRONMENTAL FACTORS [NEUROPHYSIOLOGISCHE VERARBEITUNG UND PSYCHOPHYSISCHE WIRKSAMKEIT VON UMWELTEINFLUESSEN]
Walter H. Ehrenstein *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 1-5 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21014 Max-Planck-Inst. fuer Physiologische und Klinische Forschung, Bad Nauheim (West Germany).
THE INTERFACE BETWEEN ATMOSPHERE AND ORGANISM
Friedrich-Karl Pierau *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 6-8 refs (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21016 Dortmund Univ. (West Germany). Inst. fuer Arbeitsphysiologie.
MAN'S THERMAL BUDGET UNDER VARIOUS CLIMATES [WAERMBEBILANZ DES MENSCHEN IN VERSCHIEDENEN KLIMATEN]
Hans Gerd Wenzel *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 12-16 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21017 Technische Univ., Munich (West Germany). Lehrstuhl fuer Bioklimatologie und Angewandte Meteorologie.
APPLICATION OF A NONSTATIONARY ENERGY BUDGET MODEL TO DETERMINE THERMAL COMFORT [ANWENDUNG-SMOEGLICHKEITEN EINES INSTATIONAEREN ENERGIEBILANZMODELLS ZUR BEWERTUNG DER THERMISCHEN BEHAGLICHKEIT]
Peter Hoeppe *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 17-18 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21018 Fraunhofer-Inst. fuer Bauphysik, Stuttgart (West Germany). Institutsbereich Waerme/Klima.
PHYSICAL CAUSES OF AIR DRAFT PHENOMENA, NEW FACTS [PHYSIKALISCHE URSACHEN FUER ZUGERSCHEINUNGEN - NEUE ERKENNTNISSE]
Erhard Mayer *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 19-20 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21019 Technische Univ., Munich (West Germany). Inst. fuer Medizinische Balneologie und Klimatologie.
CLIMATIC CURE ON A PRACTICAL LEVEL [KLIMATUR IN DER PRAXIS]
Angela Schuh *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 21-22 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21020 Meteorologischer Dienst der DDR, Berlin (East Germany). Forschungsinst. fuer Bioklimatologie.
ON THE IMPORTANCE OF COOLING IN CLIMATIC THERAPY [ZUR BEDEUTUNG DER ABKUEHLUNG IM RAHMEN DER KLIMATHERAPIE]
L. Klinker and E. Turowski *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 23-24 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21021 National Inst. for Rheumatics and Physiotherapy, Budapest (Hungary).
THE INFLUENCE OF HELIOMETEOROLOGIC FACTORS ON CIRCULATION AND SOME VEGETATIVE FUNCTIONS
Imre Oermenyi *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 25-26 (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21022 Institute of Meteorology and Water Management, Podlesna (Poland). Dept. of Climatology.
METEOROTROPIC DETERMINANTS OF ROAD COLLISIONS AND ACCIDENTS
Maria Baranowska and Barbara Gabryl-Wojtach *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 27-28 ref (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21023 Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria). Neurochirurgische Ambulanz am Ambulatorium. Sued.
OBJECTIVE INVESTIGATIONS AND SUBJECTIVE OBSERVATIONS OF SENSITIVITY TO WEATHER [OBJEKTIVE UNTERSUCHUNGEN UND SUBJEKTIVE BEOBACHTUNGEN UEBER WETTERFUEHLIGKEIT]
Fritz J. Jenkner *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 29-30 In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21024 Hydrometeorological Inst. of the Socialist Republic of Croatia, Zagreb (Yugoslavia).
COLLOIDAL AND METEOROLOGICAL IN VITRO REACTIONS
Nada Plesko *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 31-32 refs (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21025 Universitaetsspital, Zurich (Switzerland). Biologisches Zentrallaboratorium.
WEATHER SENSITIVITY AS DISCOMFORT [DIE WETTERFUEHLIGKEIT ALS DISKOMFORT]
Wolf H. Weihe *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 35-37 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21026 Deutscher Wetterdienst, Freiburg (West Germany). Zentrale Medizin-Meteorologische Forschungsstelle.
WEATHER AS A PHYSICAL PROCESS AND PARAMETERIZATION OF THE EFFECTS AS A METEOROLOGICAL CONTRIBUTION FOR INVESTIGATING THE CORRELATION BETWEEN WEATHER AND MAN [DAS WETTER ALS PHYSIKALISCHE PROZESS UND SEINE WIRKUNGSRELEVANTE PARAMETRISIERUNG ALS METEOROLOGISCHER BEITRAG ZUR UNTERSUCHUNG DER BEZIEHUNG WETTER - MENSCH]
Klaus Bucher *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 38-41 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21027 Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria). Ambulatorium Sued.
WEATHER AND MIGRAINE [WETTER UND MIGRAENE]
Fritz L. Jenkner and Alois Machalek *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 43-44 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21028 Hydrometeorological Inst. of the Socialist Republic of Croatia, Zagreb (Yugoslavia).
TEMPERATURE WIND SPEED HUMIDITY (TWH): A BIOMETEOROLOGICAL INDEX TESTING
Ksenija Zaninovic *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 45-46 refs (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21029 Jugenddorf Christophorusschule, Berchtesgaden (West Germany). Asthmatherapiezentrum.
WEATHER AND ASTHMA SYMPTOMS [WETTER UND ASTHMASYMPTOMATIK]
J. Lecheler and M. Voelker *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 47-48 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21030 Central Meteorological Service, Peking (China).
STUDY OF A METEOROLOGICAL PREDICTION OF ACUTE MYOCARDIAL INFARCTION INCIDENCE
Yianwen Wang and Xuecui Zhang (Lianyungang Ocean Station, China) *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 49-50 refs (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21031 Forschunginstitut fuer Balneologie, Marianske Lazne (Czechoslovakia).
METEOROTROPIC CHANGES OF CARDIAC PATIENTS' BLOOD PRESSURE AND PULSE FREQUENCY DURING A COMPLEX BATH CURE [METEOROTROPE VERAENDERUNGEN DES BLUTZUCKERS UND DER PULSFREQUENZ DER HERZKRANKEN IM VERLAUF DER KOMPLEXEN BAEDERKUR]
Vit Kveton, Jiri Matousek, and Zdenek Sebesta *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 51-52

In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21032 Forschunginstitut fuer Balneologie, Marianske Lazne (Czechoslovakia).
WEATHER AND SUBJECTIVE HEALTH COMPLICATIONS IN CARDIAC PATIENTS [DAS WETTER UND DIE SUBJEKTIVEN GESUNDHEITSSCHWIERIGKEITEN DER HERZKRANKEN]
Vit Kveton *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 53-54 In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21033 Deutscher Wetterdienst, Offenbach am Main (West Germany).
INVESTIGATIONS OF THE POSSIBLE INFLUENCE OF AIR ELECTRICAL PHENOMENA ON DULLING AND GHOST ACHING IN AMPUTATED PATIENTS [UNTERSUCHUNGEN UEBER EINEN MOEGLICHEN EINFLUSS VON LUFTELEKTRISCHEN ERSCHEINUNGEN AUF STUMPF- UND PHANTOMSCHMERZEN BEI AMPUTIERTEN]
J. Pelz (Freie Univ., Berlin, West Germany) and H. J. Swantes *In its* Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 55-56 ref In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21034 Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria).
THE AUSTRIAN BIOMETEOROLOGICAL SERVICE [DER OESTERREICHISCHE BIOWETTERDIENST]
Alois Machalek and Peter Sabo *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 57-58 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21036 Jugenddorf Christophorusschule, Berchtesgaden (West Germany). Asthmatherapiezentrum.
HEIGHT-DEPENDENT REDUCTION OF AIRBORNE POLLEN AND EFFECTS ON CHILDREN AND TEENAGERS AFFECTED BY BRONCHIAL ASTHMA [HOEHENABHAENGIGIGE REDUZIERUNG DES POLLENFLUGS UND DIE AUSWIRKUNG AUF KINDER UND JUGENDLICHE MIT ASTHMA BRONCHIALE]
J. Lecheler, M. Voelker, and R. Winkler *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 63-64 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21038 Duesseldorf Univ. (West Germany). Medizinisches Inst. fuer Umwelthygiene.
EFFECTS OF AIR POLLUTION ON MAN [WIRKUNG VON LUFTVERUNREINIGUNGEN AUF DEN MENSCHEN]
H.-W. Schlipkoeter and K. Beyen *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 67-69 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21039 Giessen Univ. (West Germany). Hygiene-Inst.
GROUP DIAGNOSIS AS RISK ASSESSMENT IN ENVIRONMENT HYGIENE [GRUPPENDIAGNOSTIK ALS RISIKOABSCHAETZUNG IN DER UMWELTHYGIENE]
Pavel Schmidt and Ernst Gerhard Beck *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 70-71 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21040 Freie Univ., Berlin (West Germany). Rittberg-Kinderklinik.
IMMISSION AND WEATHER EFFECTS ON CHILDREN'S AIRWAY ILLNESSES IN BERLIN (1979-1982): METHODOLOGY AND RESULT SUMMARY [IMMISSIONS- UND WETTEREINFLUESSE AUF ATEMWEGSERKRANKUNGEN VON KINDERN IN BERLIN (1979-1982). METHODIK UND ERGEBNISUEBERBLICK]
Ulrich Fegeler, Roman Moyzes, Erich Wedler, and Kurt Eberhard *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 72-74 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21041 Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria).
ENVIRONMENTAL FACTORS AND INFANT MORTALITY [UMWELTFAKTOREN UND SAEUGLINGSSTERBLICHKEIT]
Alois Machalek, Helene Kapaun, and Ermar Junker *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 75-76 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21042 Gesamthochschule, Kassel (West Germany).
AIRWAY INFECTIONS RELATED TO CITY CLIMATE AND LOCAL IMMISSION LOAD [ATEMWEGSERKRANKUNGEN IN ABHAENGIGKEIT VON STADTKLIMA UND LOKALER IMMISSIONSBELASTUNG]
Lutz Katzschner *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 77-79 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21043 Technische Univ., Munich (West Germany). Inst. fuer Medizinische Balneologie und Klimatologie.
WHAT IN HUMAN BIOMETEOROLOGY CAN CONTRIBUTE TO ASSESSMENT OF THE EFFECTS OF HAZARDOUS SUBSTANCES ON HEALTH? [WAS KANN DIE HUMANBIOMETEOROLOGIE ZUR BEWERTUNG GESUNDHEITLICHER WIRKUNGEN VON SCHADSTOFFEN BEITRAGEN]
Karl Dirnagl *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 80-81 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21044 Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.
IMMISSION AND WEATHER EFFECTS ON CHILDREN'S AIRWAY TROUBLES IN BERLIN (1979-1982). TIME SERIES INVESTIGATIONS: CROUP SYNDROME AND ASTHMATIC AIRWAY TROUBLES [IMMISSIONS- UND WETTEREINFLUESSE AUF ATEMWEGSERKRANKUNGEN VON KINDERN IN BERLIN (1979-1982) ZEITREIHENUNTERSUCHUNGEN: CROUPSYNDROM UND ASTHMATISCHE ATEMWEGSERKRANKUNGEN]
Ulrich Fegeler, Roman Moyzes, Erich Wedler, and Kurt Eberhard *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 82-85 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21045 Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.
IMMISSION AND WEATHER EFFECTS ON CHILDREN'S AIRWAY TROUBLES IN BERLIN (1979-1982). COMPARISON OF TWO DIFFERENT IMMISSIONS: LOADED RESIDENTIAL AREAS IN WEST BERLIN POLLUTED AREAS [IMMISSIONS- UND WETTERFLUESSE AUF ATEMWEGSERKRANKUNGEN VON KINDERN IN BERLIN (1979-1982). VERGLEICH ZWEIER UNTERSCHIEDLICH IMMISSIONSBELASTETER WOHNBEREICHE IM BELASTUNGSGEBIET BERLIN (WEST)]
Ulrich Fegeler, Roman Moyzes, Erich Wedler, and Kurt Eberhard

In Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 86-87 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21046 Technische Univ., Munich (West Germany). Inst. fuer Medizinische Balneologie.
AIR QUALITY DETERMINATION IN HEALTH RESORTS [LUFTQUALITAETSBESTIMMUNG IN KURORTEN]
Angela Schuh *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 88-89 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21047 Deutscher Wetterdienst, Freiburg (West Germany). Zentrale Medizinmeteorologische Forschungsstelle.
THE BIOLOGICAL EFFICIENCY OF DUST IMMISSION: DETERMINATION BASED ON THE WITHERING DEGREE OF EXPOSED LICHENS [DIE BIOLOGISCHE WIRKSAMKEIT VON STAUBIMMISSIONEN: ERMITTELT ANHAND DES ABSTERBEGRADES EXPONIERTER FLECHTEN]
R. Rabe and E. Schultz *In its* Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 90-91 In GERMAN Prepared in cooperation with Rheinische Westfaelische Technischer Ueberwachungs-Verein e.V., Essen, West Germany (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21049 Deutscher Wetterdienst, Offenbach am Main (West Germany).
PROBLEMS OF CITY PLANNING [PROBLEME DER STADTPLANUNG]
Bob Frommes *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 95-98 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21050 Technische Univ., Munich (West Germany). Lehrstuhl fuer Bioklimatologie und Angewandte Meteorologie.
PROBLEMS IN CITY CLIMATE EVALUATION IN HUMAN BIOMETEOROLOGICAL TERMS [PROBLEMATIK BEI DER HUMANBIOMETEOROLOGISCHE BEWERTUNG DES STADTKLIMAS]
Helmut Mayer *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 99-100 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21058 Austrian Automobile Touring Club, Vienna. Medizinmeteorologischer Beratungsdienst.
HUMAN BIOCLIMATIC CLASSIFICATION METHODS ILLUSTRATED WITH EXAMPLES OF SELECTED COUNTRIES HUMANBIOKLIMATISCHE KLASSIFIZIERUNGSMETHODEN AM BEISPIEL AUSGEWAEHLTER LAENDER]
Othmar Harlfinger *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 119-121 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21059 Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria).
COMPARISON BETWEEN METEOROLOGICAL COMPLEX VALUES AND A MODEL OF MAN'S ENERGY BUDGET [VERGLEICH ZWISCHEN METEOROLOGISCHEN KOMPLEXGROESSEN UND EINEM ENERGIEBILANZMODELL DES MENSCHEN]
Norbert Hammer, Elisabeth Koch, and Ernst Rudel *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 122-123 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21064 Deutscher Wetterdienst, Offenbach am Main (West Germany).
LOCAL CLIMATIC PARTICULARITIES AND THEIR IMPORTANCE FOR RECREATION AREA (EXAMPLE, SAARLAND-LOWER BLIESTAL) [LOKALKLIMATISCHE BESONDERHEITEN IN IHRER BEDEUTUNG FUER ERHOLUNGSGEBIETE (AM BEISPIEL SAARLAND-ERHOLUNGSRAUM UNTERES BLIESTAL)]
Hans Juergen Swantes *In its* Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 132-133 ref In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21065 Deutscher Wetterdienst, Freiburg (West Germany). Zentrale Medizin-Meteorologische Forschungsstelle.
SPATIAL DISTRIBUTION OF HEAT AND COLD STRESS IN THE FEDERAL REPUBLIC OF GERMANY [DIE RAEUMLICHE VERTEILUNG VON WAERMEBELASTUNG UND KAELTESTRESS IN DER BUNDESREPUBLIK DEUTSCHLAND]
G. Jendritzky *In its* Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 134-136 refs In GERMAN (For primary document see N86-21012 11-47)
Avail: Issuing Activity

N86-21067 Institute of Balneology and Climatology, Poznani (Poland).
APPLICATION OF METEOROLOGICAL AND SOLAR DATA IN HEALTH RESORT CLIMATHERAPY
Sabina Tyczka and Irena Ponikowska *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology 13 Aug. 1985 p 140-141 (For primary document see N86-21012 11-47)
Avail: Issuing Activity

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N86-21138*# Federation of American Societies for Experimental Biology, Bethesda, Md. Life Sciences Research Office.
RESEARCH OPPORTUNITIES ON IMMUNOCOMPETENCE IN SPACE
William R. Beisel, ed. and John M. Talbot, ed. Dec. 1985 54 p refs
(Contract NASw-3924)
(NASA-CR-176482; NAS 1.26:176482) Avail: NTIS HC A04/MF A01 CSCL 05I

The most significant of the available data on the effects of space flight on immunocompetences and the potential operational and clinical significance of reported changes are as follows: (1) reduced postflight blastogenic response of peripheral lymphocytes from space crew members; (2) postflight neutrophilia persisting up to 7 days; (3) gingival inflammation of the Skylab astronauts; (4) postflight lymphocytopenia, eosinopenia, and monocytopenia; (5) modifications and shifts in the microflora of space crews and spacecraft; and (6) microbial contamination of cabin air and drinking water. These responses and data disclose numerous gaps in the knowledge that is essential for an adequate understanding of space-related changes in immunocompetence.
Author

N86-21139*# Illinois Univ., Urbana-Champaign. Engineering Psychology Research Lab.
THE DISSOCIATION OF SUBJECTIVE MEASURES OF MENTAL WORKLOAD AND PERFORMANCE Final Report
Yei-Hu Yeh and Christopher D. Wickens Oct. 1984 98 p

(Grant NAG2-169)
(NASA-CR-176609; NAS 1.26:176609; EPL-84-2/NASA-84-2)
Avail: NTIS HC A05/MF A01 CSCL 05I

Dissociation between performance and subjective workload measures was investigated in the theoretical framework of the multiple resources model. Subjective measures do not preserve the vector characteristics in the multidimensional space described by the model. A theory of dissociation was proposed to locate the sources that may produce dissociation between the two workload measures. According to the theory, performance is affected by every aspect of processing whereas subjective workload is sensitive to the amount of aggregate resource investment and is dominated by the demands on the perceptual/central resources. The proposed theory was tested in three experiments. Results showed that performance improved but subjective workload was elevated with an increasing amount of resource investment. Furthermore, subjective workload was not as sensitive as was performance to differences in the amount of resource competition between two tasks. The demand on perceptual/central resources was found to be the most salient component of subjective workload. Dissociation occurred when the demand on this component was increased by the number of concurrent tasks or by the number of display elements. However, demands on response resources were weighted in subjective introspection as much as demands on perceptual/central resources. The implications of these results for workload practitioners are described. Author

N86-21140# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
THE EFFECT OF ACCELERATION STRESS ON HUMAN WORKLOAD
W. B. Albery, S. L. Ward, and R. T. Gill May 1985 26 p
(AF Proj. 7231)
(AD-A156770; AMRL-TR-85-039) Avail: NTIS HC A03/MF A01 CSCL 06/19

The effects of +Gz stress on operator task performance and workload are assessed. Subjects were presented a two-dimensional maze on a CRT, and were required to solve it as rapidly as possible while under G-stress at levels from +Gz to +6Gz. The G-stress was provided by a human centrifuge. The effects of this stress were assessed by two techniques: objective performance measures on the primary maze - solving task, and subjective workload measures obtained using the Subjective Workload Assessment Technique (SWAT). It was found that while neither moderate (+3Gz) nor high (+5Gz and +6Gz) levels of G stress affected maze solving performance, the high G levels did significantly increase the subjective workload of the maze task. Author

N86-21141# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
ATTENTION ALLOCATION, DISTRACTION, AND THE TYPE A/TYPE B BEHAVIOR PATTERN M.S. Thesis
A. J. Guardino Aug. 1985 100 p
(AD-A160671; AFIT/CI/NR-85-109T) Avail: NTIS HC A05/MF A01 CSCL 05/10

This thesis sought to determine whether individuals identified as having a Type A or Type B behavior pattern allocate attention differently in the presence of a distractor. Thirty-seven university students, grouped by type through use of the Jenkins Activity survey, and further divided into distractor and control groups, performed two discrete tasks for eight blocks under single- then dual-task conditions. The distractor was presented during the dual-task condition on Blocks 6 and 7. While the results did not support the hypothesized relation, this study did support previous findings of a differential effect of noise on multiple-task performance: Both quiet groups' performance improved on both tasks, whereas both noise groups' performance improved on the primary task but leveled off on the secondary task during and after the distractor. Further research is required. GRA

N86-21142# Colorado Univ., Boulder.
PRINCIPLES OF INSTRUCTION FOR SUCCESSFUL ASSEMBLY AND REPAIR Final Report, 1 Nov. 1983 - 31 Nov. 1984
Patricia Baggett 31 Nov. 1984 14 p
(Contract N00014-84-C-0112)
(AD-A161280) Avail: NTIS HC A02/MF A01 CSCL 05/9

In this one-year project the aim was to continue the previous three years' research on designing multimedia instructions for procedures so that people could use and learn from them more easily. There were both theoretical and practical aspects to the work. We viewed the conceptual structure of a task as a (hierarchical) tree (later a directed acyclic graph) with nodes representing information from different modalities (motoric, visual, and linguistic). The overview will be preceded by a short summary, stating the five main studies, the total number of subject hours run, stimulus materials used, and computer programming done. At the end are listed technical reports, conference papers, and publications. Main Studies: (1) Transforming a task's tree structure to lessen short term memory load in instructions, (2) Developing generic and functional terminology, (3) Theoretical hypotheses about what narration in dual media presentations should consists of, (4) Transfer of learning in assembly tasks, and (5) Empirical investigation of adequacy of knowledge representation for repair in a computerized tutor. GRA

N86-21143# California Univ., San Diego. Jolla.
INTERACTIVE ACTIVATION MODELS OF PERCEPTION AND COMPREHENSION Status Report, 1 Dec. 1984 - 1 Oct. 1985
Jeffrey L. Elman and James L. McClelland 1 Oct. 1985 15 p
(Contract N00014-85-K-0076)
(AD-A161362) Avail: NTIS HC A02/MF A01 CSCL 05/10

The objective of this research is to construct a computationally sufficient, biologically plausible, and behaviorally adequate account of human information processing skills in visual and auditory language processing. We have the following specific research goals for our contract: (1) To implement a model of reading printed text through a series of fixations. The model is intended to account for the integration of visual information over successive fixations, and the interaction of visual and contextual information in reading. (2) To implement a new version of our model of speech perception (TRACE), using programmable connections to allow the model to tune itself, in the course of processing, to changes in global parameters such as rate. This new model (which we will call the Programmable TRACE) is intended to account for human sensitivity to global as well as local contextual influences on the speech signal while retaining all the virtures of the present version of TRACE. (3) To begin work on the development of simulation models designed to capture aspects of interactions between lexical, syntactic, and semantic constraints on the construction of syntactic and functional representations of sentences. GRA

N86-21144# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
A PROCEDURE-BASED APPROACH TO HUMAN INFORMATION PROCESSING MODELS
Kevin L. Boettcher and Robert R. Tenney Nov. 1985 37 p
(Contracts N00014-77-C-0532; N00014-84-K-0519)
(AD-A162454; LIDS-P-1499) Avail: NTIS HC A03/MF A01 CSCL 05/10

An approach is suggested for modeling human processing time in routine tasks. The existence of mental processing methods, or procedures, is presumed and the approach uses information theoretic concepts to develop a functional relationship between task variables and processing time for a given procedure. The resulting model contains parameters that must be estimated using processing time data. In addition to considering the single-procedure model, the modeling framework is extended to include situations where multiple procedures are used in an alternate fashion. The information theoretic framework provides a specific model form for the extra time required for switching to, or activating, a procedure. The modeling approach is tested experimentally in two ways. First, a single procedure task is devised for which a model is developed. Second, a multiple procedure task is devised to test the model for switching. Experimental results in both cases give evidence in support of the approach as a method for describing task processing time in terms of task variables. Author (GRA)

N86-21145# Leiden Univ. (Netherlands). Inst. of Mathematics.
ON INTERACTING POPULATIONS THAT DISPERSE TO AVOID CROWDING: THE EFFECT OF A SEDENTARY COLONY
M. Bertsch, M. E. Gurtin (Carnegie-Mellon Univ., Pittsburgh, Pa.), D. Hilhorst, and L. A. Peletier Mar. 1983 30 p refs
(Rept-4) Avail: NTIS HC A03/MF A01

A population model in which a finite number of interacting groups attempt to avoid crowding is considered. A habitat containing a mobile and a sedantary species is studied. It is shown that when the mobile population is sufficiently large relative to the sedentary population, the mobile species eventually populates the entire habitat. However, when mobile species density is less than that of the sedentary species, the mobile individuals do not reach the portion of the habitat that lies to the other side of the sedentary colony. Author (ESA)

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N86-21146 Central Electricity Generating Board, London (England).
RADIOPROTECTION UPDATE
Jacques Leclercq 14 Nov. 1985 19 p Transl. into ENGLISH from Epure (France), no. 7, Jul. 1985 p 49-57
(BLL-CE-Trans-8223-(9022-09)) Avail: British Library Lending Div., Boston Spa, Engl.

The problems involved in the radiation protection of nuclear power plant workers are illustrated. It is shown how and the safety of these workers, which is already ensured by the strict observance of public health requirements relating to occupational irradiation, can be improved by means of rational management. Radiation dosage, radiation distribution in the plants, reactor coolant chemistry, shutdown procedures, and nuclear fuels are among the topics discussed. R.J.F.

N86-21147*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MOBILE REMOTE MANIPULATOR VEHICLE SYSTEM Patent Application
Harold G. Bush, Martin M. Mikulas, Jr., Richard E. Wallsom, and J. Kermit Jensen, inventors (to NASA) Filed 31 Jul. 1985 27 p
(NASA-Case-LAR-13393-1; NAS 1.71:LAR-13393-1; US-Patent-Appl-SN-760799) Avail: NTIS HC A03/MF A01 CSCL 05H

A mobile remote manipulator system is disclosed for assembly, repair and logistics transport on, around and about a space station square bay truss structure. The vehicle is supported by a square track arrangement supported by guide pins integral with the space station truss structure and located at each truss node. Propulsion is provided by a central push-pull drive mechanism that extends out from the vehicle one full structural bay over the truss and locks drive rods into the guide pins. The track switches allow the vehicle to travel in two (2) orthogonal directions over the truss structure which coupled with the bi-directional drive, allow movement in four (4) directions on one plane. The top layer of this tri-layered vehicle is a logistics platform. This platform is capable of 360 degrees of rotation and will have two (2) astronaut foot restraint platforms 18 and a space crane integral. NASA

N86-21148# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
INSTRUMENT LIGHTING LEVELS AND AN/AVS-6 USAGE Final Report
William M. Slusher Aug. 1985 48 p
(AF Proj. 718-4)
(AD-A161538; AAMRL-TR-85-055) Avail: NTIS HC A03/MF A01 CSCL 14/2

Two experimental investigations were performed to determine the effects of the AN/AVS-6 Aviators Night Vision Imaging System (ANVIS) display luminance on the setting of instrument lighting levels. In a laboratory study using a simulated A-10 night lighting mockup, eight subjects adjusted instrument lighting levels to what they judged to be the minimum required for safe readability of instruments. Prior to the adjustment of instrument lighting, the subjects were preadapted to various ambient lighting conditions, including a simulated ground luminance of a full moonlit night and two simulated ANVIS display luminances. Results show primary instrument lighting levels were set higher, by a factor of 1.6 following adaptation to the 1.0 foot lambert (ft-L) ANVIS luminance test condition when compared to lighting levels set following adaptation to a 0.00065 ft-L ambient luminance condition. GRA

N86-21149# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
HUMAN ENGINEERING GUIDELINES FOR THE EVALUATION AND ASSESSMENT OF VIDEO DISPLAY UNITS
W. E. Gilmore Jul. 1985 537 p
(TI85-016435; NUREG/CR-4227) Avail: NTIS HC A23/MF A01

The Nuclear Regulatory Commission is provided with a single source that documents known guidelines for conducting formal Human Factors evaluation of Video Display Units (VDUs). The handbook is a cookbook of acceptance guidelines for the reviewer faced with the task of evaluating VDUs already designed or planned for service in the control room. The areas addressed are video displays, controls, control/display integration, and workplace layout. Guidelines relevant to each of those areas are presented. The existance of supporting research is also indicated for each guideline. A Comment section and Method for Assessment section are provided for each set of guidelines. Author

N86-20638# Lone Star Army Ammunition Plant, Texarkana, Tex.
EVALUATION OF MATERIALS FOR THERMAL PROTECTION
J. I. Martin *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 2 Aug. 1984 p 1671-1687 (For primary document see N86-20623 11-31)
(AD-P004901) Avail: NTIS HC A99/MF E03 CSCL 13/12

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

N86-21150*# National Aeronautics and Space Administration, Washington, D.C.
PUBLICATIONS OF THE EXOBIOLOGY PROGRAM FOR 1984: A SPECIAL BIBLIOGRAPHY
Janice S. Wallace, comp. and Donald L. DeVincenzi, comp. Feb. 1986 45 p Prepared in cooperation with George Washington Univ., Washington, D.C.
(Contract NASw-3165)
(NASA-TM-88382; NAS 1.15:88382) Avail: NTIS HC A03/MF A01 CSCL 03B

A bibliography of NASA exobiology programs is given. Planetary environments; chemical evolution; organic geochemistry; extraterrestrial intelligence; and the effect of planetary solar and astrophysical phenomena on the evolution of complex life in the universe are among the topics listed. R.J.F.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N86-21151*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
[ACTIVITIES OF THE INSTITUTE FOR COMPUTER APPLICATIONS IN SCIENCE AND ENGINEERING] Semiannual Report, 1 Apr. - 2 Oct. 1985

Nov. 1985 64 p refs
(Contracts NAS1-17070; NAS1-17130)
(NASA-CR-178020; NAS 1.26:178020) Avail: NTIS HC A04/MF A01 CSCL 12A

Research conducted at the Institute for Computer Applications in Science and Engineering in applied mathematics, numerical analysis, and computer science during the period April 1, 1985 through October 2, 1985 is summarized. Author

N86-21152*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A RIEMANN SOLVER BASED ON A GLOBAL EXISTENCE PROOF FOR THE RIEMANN PROBLEM Final Report
Pravir Dutt Jan. 1986 13 p refs Submitted for publication
(Contracts NAS1-17070; NAS1-18107)
(NASA-CR-178042; ICASE-86-3; NAS 1.26:178042) Avail: NTIS HC A02/MF A01 CSCL 12A

Godunov's method and several other methods for computing solutions to the equations of gas dynamics use Riemann solvers to resolve discontinuities at the interface between cells. A new method is proposed here for solving the Riemann problem based on a global existence proof for the solution to the Riemann problem. The method is found to be very reliable and computationally efficient. Author

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

N86-21153 New South Wales Univ., Kensington (Australia).
DIGITAL DIFFERENTIAL ANALYSERS Abstract Only
Max B. Webster Dec. 1984 2 p
Avail: Issuing Activity

Hitherto, Digital Differential Analyzers (DDAs) have been restricted to the use of a predetermined, constant integration step size. Second Order Difference transmission, developed by Bywater, allows the potential problem of variable intermodule data path width associated with variable step-size (VSS) integration to be avoided, and VSS overcomes the starting problem of Second Order Differences. Here, the modifications necessary for Second Order Difference, Extended Resolution DDA modules to be able to cope with VSS are detailed. The resulting VSSDDA structure is eminently suitable for special purpose, dedicated applications where foreknowledge of solution characteristics permits external control of step-size. The application of truncation error analysis to nonlinear differential equations (DEs) is investigated, and a new class of nonlinear DEs, developed for the testing of VSS algorithms, is presented. With these equations, VSS integration can yield speed improvement factors in excess of 100 to 1 over constant step-size integration. Finally, a new method for solving stiff DEs, based on existing explicit integration methods and suitable for DDA hardware implementation, is proposed. Solution speed improvement factors of up to 10 to 1 over standard explicit methods were achieved. R.J.F.

N86-21154* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AUTO COVARIANCE COMPUTER Patent
Timothy E. Hepner and James F. Meyers, inventors (to NASA) Issued 1 Oct. 1985 6 p Filed 16 Aug. 1983
(NASA-Case-LAR-12968-1; US-Patent-4,545,025;
US-Patent-Appl-SN-523560; US-Patent-Class-364-728) Avail: US Patent and Trademark Office CSCL 09B

A laser velocimeter covariance processor which calculates the auto covariance and cross covariance functions for a turbulent flow field based on Poisson sampled measurements in time from a laser velocimeter is described. The device will process a block of data that is up to 4096 data points in length and return a 512 point covariance function with 48-bit resolution along with a 512 point histogram of the interarrival times which is used to normalize the covariance function. The device is designed to interface and be controlled by a minicomputer from which the data is received and the results returned. A typical 4096 point computation takes approximately 1.5 seconds to receive the data, compute the covariance function, and return the results to the computer.
Official Gazette of the U.S. Patent and Trademark Office

N86-21155 British Aerospace Dynamics Group, Bristol (England). Dept. 260.
PRELIMINARY INVESTIGATION INTO THE FEASIBILITY OF AN M700/40 BASED REPLACEMENT FOR THE LORAL CPU FOR THE RAPPORT SYSTEM ANALYSIS PROCESSOR
P. J. Ireland Feb. 1982 21 p
(BAe-BT-12862) Copyright. Avail: Issuing Activity

The Loral processor and the M700/40 are described. Features necessary in M700/40 to provide a Loral compatable replacement are explained. Processor speeds are compared. It is shown that the suitability depends on information concerning the operational program tasks and compiler. Author (ESA)

N86-21156# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
CWI NEWSLETTER, NO. 4, SEPTEMBER 1984
Arjeh M. Cohen, ed., Richard D. Gill, ed., and Jan Heering, ed. Sep. 1984 54 p refs
(ISSN-0168-821x) Avail: NTIS HC A04/MF A01

Stochastic geometry and image analysis; computer aided typesetting; and order statistics, quantile processes, and extreme value theory are discussed. For individual titles, see N86-21157 through N86-21159.

N86-21157# Bath Univ. (England). School of Mathematics.
STOCHASTIC GEOMETRY AND IMAGE ANALYSIS
A. J. Baddeley *In* Center for Mathematics and Computer Science CWI Newsletter Sep. 1984 p 2-20 refs (For primary document see N86-21156 11-60)
Avail: NTIS HC A04/MF A01

Ideas in stochastic geometry which are closely related to image analysis are listed. These include the synthesis of stochastic models of images; techniques for evaluating models and algorithms; general concepts of geometrical information and the theory of random sets; problems of image irregularity and errors in observation; techniques of geometric integration theory; and fractional dimensional irregularity. Author (ESA)

N86-21158# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
TYPESETTING AT THE CENTER FOR MATHEMATICS AND COMPUTER SCIENCE (CWI), PART 2
Jaap Akkerhuis *In its* CWI Newsletter Sep. 1984 p 21-32 refs (For primary document see N86-21156 11-60)
Avail: NTIS HC A04/MF A01

Computer aided printing of tables, graphs, and mathematical material is illustrated. Author (ESA)

N86-21159# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
ORDER STATISTICS, QUANTILE PROCESSES AND EXTREME VALUE THEORY c65
R. Helmers *In its* CWI Newsletter Sep. 1984 p 33-38 refs Presented at Meetingheld in Oberwolfach, West Germany, 25-31 Mar. 1984 (For primary document see N86-21156 11-60)
Avail: NTIS HC A04/MF A01

Spacings theory, empirical and quantile processes, estimation of the tail of a distribution, and extreme value theory are discussed. Author (ESA)

N86-21160# Harvard Univ., Cambridge, Mass. Computation Lab.
DERIVATION OF RANDOMIZED ALGORITHMS
Sanguthevar Rajasekaran and John H. Reif Oct. 1985 26 p

(Contract N00014-80-C-0647)
(AD-A161358; TR-16-85) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper surveys a number of efficient randomized algorithms for selection and sorting which we derive from inefficient deterministic specifications. Along with these derivations, we simultaneously derive bounds on the probability distribution of the sequential and parallel time cost of these algorithms. There are several potential benefits of this work. We develop, for the first time, general techniques for deriving randomized algorithms from deterministic specifications. Previous derivations only considered deterministic algorithms. Furthermore, our derivations encompass many known sequential and parallel randomized algorithms for selection and sorting which required separate proofs and probabilistic analysis. Also, we present a new randomized comparison sorting algorithm that takes 0(loglogn) time and uses n1+ epsilon processors to sort n keys. GRA

N86-21161# Massachusetts Inst. of Tech., Cambridge. Dept. of Electrical Engineering and Computer Science.
COMPUTING MINIMUM SPANNING TREES ON A FAT-TREE ARCHITECTURE M.S. Thesis
Bruce M. Maggs Oct. 1985 40 p
(Contract N00014-80-C-0622)
(AD-A161434) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper presents two parallel algorithms for computing the minimum spanning forest of an input graph on a fat-tree architecture. One algorithms if deterministic, and the other probabilistic. The deterministic algorithm generates O(cv log/V/) message sets, each of which can be delivered in O(beta (G) delivery cycles. The probabilistic algorithm generates O(sq log/V/) message sets, each of which can be delivered in O(beta(G)) delivery cycles. Author (GRA)

N86-21162# Naval Postgraduate School, Monterey, Calif.
AN ADAPTIVE MODEL BASED DISK FILE HEAD POSITIONING SERVO SYSTEM M.S. Thesis
Kenneth R. Wikstrom Sep. 1985 147 p
(AD-A161704) Avail: NTIS HC A07/MF A01 CSCL 09/2

The feasibility of controlling a disk file head positioning servo with an adaptive computer simulation model is investigated. During the seek mode, model updating of position, velocity, and motor gain parameter are accomplished from samples of head position only, thereby eliminating the requirement for a tachometer in the positioning servo system. In the track follow mode, three methods of linear compensation are presented to settle the transients of the servo and allow for the positioning of the read/write head on track center in minimum time. Implementation of the simulation model into a microprocessor is also investigated. Author (GRA)

N86-21163# Harvard Univ., Cambridge, Mass. Computation Lab.
OPTIMAL PARALLEL ALGORITHMS FOR INTEGER SORTING AND GRAPH CONNECTIVITY
John H. Reif 1985 30 p
(Contract N00014-80-C-0647)
(AD-A161791; TR-08-85) Avail: NTIS HC A03/MF A01 CSCL 12/1

This document gives new parallel algorithms for integer sorting and undirected graph connectivity problems such as connected components and spanning forest. These algorithms cost only logarithmic time and are the first known that are optimal: the product of their time and processor bounds are bounded by a linear function of the input size. All previous known parallel algorithms for these problems required at least a linear number of processors to achieve logarithmic time bounds, and hence were nonoptimal by at least a logarithmic factor. The author assumes a parallel random access machine (RAM) model which allows both concurrent writes and concurrent reads of global memory. The algorithms are randomized; each processor is allowed an independent random number generator; however, our stated resource bounds hold for worst case input with overwhelming likelihood as the input size grows. Author (GRA)

N86-21164# Arizona Univ., Tucson. Dept. of Chemistry.
CONVERS 3.3: A THREADED CODE INTERPRETIVE COMPILER FOR THE PDP-11 MICROCOMPUTER
G. R. Sims and M. B. Denton 25 Nov. 1985 36 p
(Contract N00014-83-K-0268)
(AD-A162420; TR-41) Avail: NTIS HC A03/MF A01 CSCL 09/2

A threaded code interpretive compiler called CONVERS 3.3 is presented. This language is intended for use in laboratory instrument control and data acquisition applications. Discussed are the philosophy behind the development of this language, the internal operation of the interpreter and the compiler, and the advantages this language offers over other programming languages in its intended applications. CONVERS is compared and contrasted to BASIC interpreters, FORTRAN compilers, and particularly to typical FORTH interpretive compilers. Programming examples and execution time benchmarks for code written in BASIC, FORTH, FORTRAN, and CONVERS are presented. Author (GRA)

N86-21165# Sandia National Labs., Albuquerque, N. Mex.
LINKED DATA BASES CONTAIN PARTS EXPLOSION
J. Carkeet and D. Jones Sep. 1985 15 p Presented at the Association of SYSTEM 2000 Users for Technical Exchange (ASTUTE), Phoenix, Ariz., 5 Nov. 1985
(Contract DE-AC04-76DP-00789)
(DE86-000433; SAND-85-2040C; CONF-8511105-1) Avail: NTIS HC A02/MF A01

A data base has been developed to provide an automated audit of all components, modules, and subsystems for a Global Positioning System that consists of a constellation of 18 satellites. The data base includes detailed fabrication, test, and operational performance data. The objective is to mitigate the effects of an avalanche of paper audits from a production program involving a proliferation of subcomponents and to facilitate quality control of an extremely complex system. Four separate SYSTEM 2000 data bases that use redundant pointers are linked to provide many-to-many relationships and to minimize mainframe resource requirements. Updates of the four data bases are facilitated by a color-form entry capability on the IBM PC. Retrievals are simplified by a menu-driven query capability. DOE

N86-21175# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
TYPESETTING AT THE CENTER FOR MATHEMATICS AND COMPUTER SCIENCE (CWI), PART 1
Jaap Akkerhuis *In its* CWI Newsletter Jun. 1984 p 15-24 refs
(For primary document see N86-21173 11-61)
Avail: NTIS HC A03/MF A01

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N86-21166 Illinois Univ., Urbana-Champaign.
A COMPUTERIZED IMPLEMENTATION OF THE MATERIAL FAILURE LOGIC MODEL TECHNIQUE Ph.D. Thesis
Wei-Rong Lue 1985 192 p
Avail: Univ. Microfilms Order No. DA8521823

The development of a computer-aided design software system intended to help designers avert mechanical failures is discussed. If competitive and reliable products are to be designed, the designer has to study the behavior of materials carefully, to assess the nature of actual service conditions, and to understand the many modes of mechanical failure. Unfortunately, there are thousands of failure case studies in the literature. The task of storing human experience painfully acquired through previous failure cases and effectively helping the designer in the prevention of the repetition of these failures is examined. Dissert. Abstr.

N86-21167# Los Alamos National Lab., N. Mex.
A STATE SPACE METHOD OF FAULT TREE ANALYSIS WITH APPLICATIONS Ph.D. Thesis
Robert J. Bartholomew Dec. 1984 198 p refs
(Contract W-7405-eng-36)
(LA-10298-T) Avail: NTIS HC A09/MF A01

Generic fault trees comprising two, three, and four statistically independent initiators in addition to common cause and common mode initiators were developed with their Markov and Adjoint models. Failure Mode State Variable (FMSV) models that represent the probabilities of failure occurrence in [0, t] of events depicted by generic fault trees were developed using modern control theory concepts. The FMSV models are contained within the Adjoint Modes. Several practical fault trees of nuclear reactor components and subsystems were modeled by the FMSV method. FMSV method is a symbiosis of fault tree analysis and Markov modeling, therefore is complete and exhaustible as a probability model. B.G.

N86-21168# National Aeronautical Lab., Bangalore (India). Aerodynamics Div.
PARAMETRIC BI-CUBIC SURFACE PATCH FOR COMPUTER AIDED GEOMETRIC DESIGN OF AIRCRAFT AND/OR OTHER THREE-DIMENSIONAL GEOMETRIES
H. N. V. Dutt Sep. 1985 58 p refs
(NAL-TM-AE-8505) Avail: NTIS HC A04/MF A01

A FORTRAN program was developed to fit smooth surfaces to the component parts of an arbitrary aircraft configuration or any three dimensional geometry. The basic surface element used for this fit is a bicubic surface patch. Once the geometry was replaced by a set of patch equations, various kinds of calculations which require a three dimensional mathematical description of the surface can be performed easily. The second part of the code generates orthographic views of the given geometry on a calcomp drum plotter or on a Tektronix screen. The last part of the program generates cross sectional plots at any desired orientation through the given configuration. Also this module can be used to generate cross sectional areas, intermediate sections and other geometric details of the given configuration. The input data is oriented mainly towards aircraft geometry. But the code can be efficiently used for representing any arbitrary surface or a combination of both. Author

N86-21169# Toronto Univ., Downsview (Ontario). Inst. for Aerospace Studies.
FLIGHT SIMULATION MOTION-BASE DRIVE ALGORITHMS. PART 1: DEVELOPING AND TESTING THE EQUATIONS
L. D. Reid and M. A. Nahon Dec. 1985 373 p refs
(UTIAS-296-Pt-1; ISSN-0082-5255) Avail: NTIS HC A16/MF A01

The development and testing of flight simulator motion-base algorithms suited to commercial jet transports is reported. Full six degrees-of-freedom motion of a synergistic motion base is studied. Three forms for these algorithms are considered: (1) classical linear washout; (2) optimal control; and (3) coordinated adaptive washout. It is felt that the latter two techniques may provide some advantages over the classical, which is currently employed in most commercial flight simulators. The aims of this project are to, develop the necessary equations, implement the necessary software in real-time, and evaluate the performance of the software with the help of test pilots in a complete flight simulation. The development of the equations and the software used for testing them is described. The evaluation of the performance of the algorithms is based on predicted pilot motion sensations and motion-based travel. The motion sensations are formulated from linear models of the human vestibular system. The test runs of the algorithms demonstrate their operation and effectiveness. Several modifications to existing formulations are suggested. E.A.K.

N86-21170# National Aeronautical Lab., Bangalore (India).
COMPUTER PROGRAM FOR PREDICTION OF DAMPED CRITICAL SPEEDS OF ROTOR SYSTEMS Propulsion Div.
V. Arun Kumar and P. Rajagopal Apr. 1985 25 p refs
(NAL-TM-PR-8502) Avail: NTIS HC A02/MF A01

The development of a computer program to calculate the flexural critical speeds of complex rotor systems is described. The program takes into account bearing stiffness, external damping provided from bearing support structures and/or squeeze film dampers and coupling effects in the rotor assembly. The program can evaluate the critical speeds of the shaft systems provided with discs producing gyroscopic effects, whirling in either forward precision or backward precision. The output prints the converged values of critical speeds, and the details of the coordinates required for plot of first three normalized mode shapes and for excess moment diagram. Calcomp plotter is used to produce the first three mode shape drawings. E.A.K.

N86-21171*# National Bureau of Standards, Boulder, Colo. Chemical Engineering Science Div.
CRYOGENIC PROPELLANT SCAVENGING Final Report, Aug. 1982 - Mar. 1985
B. Louie, N. J. Kemp, and D. E. Daney Apr. 1985 123 p refs
(NASA Order T-6077-J)
(NASA-CR-176600; NAS 1.26:176600; PB86-100682;
NBSIR-85/3023) Avail: NTIS HC A06/MF A01 CSCL 22B

A detailed description of a computer model that has been developed for assessing the feasibility of low g cryogen propellant scavenging from the space shuttle External Tank (ET) is given. Either pump-assisted or pressure-induced propellant transfer may be selected. The program will accept a wide range of input variables, including the fuel to be transferred (LOX or LH2), heat leaks, tank temperatures, and piping and equipment specifications. The model has been parametrically analyzed to determine initial design specification for the system. GRA

N86-21172*# Informatics, Inc., Palo Alto, Calif.
PROFILE USER'S GUIDE
Leslie Collins and David Saunders Feb. 1986 138 p refs
(Contract NAS2-11555)
(NASA-CR-177332; NAS 1.26:177332; Rept-7104-307-11) Avail: NTIS HC A07/MF A01 CSCL 09B

User information for program PROFILE, an aerodynamics design utility for refining, plotting, and tabulating airfoil profiles is provided. The theory and implementation details for two of the more complex options are also presented. These are the REFINE option, for smoothing curvature in selected regions while retaining or seeking some specified thickness ratio, and the OPTIMIZE option, which seeks a specified curvature distribution. REFINE uses linear techniques to manipulate ordinates via the central difference approximation to second derivatives, while OPTIMIZE works directly with curvature using nonlinear least squares techniques. Use of programs QPLOT and BPLOT is also described, since all of the plots provided by PROFILE (airfoil coordinates, curvature distributions) are achieved via the general purpose QPLOT utility. BPLOT illustrates (again, via QPLOT) the shape functions used by two of PROFILE's options. The programs were designed and implemented for the Applied Aerodynamics Branch at NASA Ames Research Center, Moffett Field, California, and written in FORTRAN and run on a VAX-11/780 under VMS. Author

N86-21173# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
CWI NEWSLETTER, NO. 3, JUNE 1984
Arjeh M. Cohen, ed., Richard D. Gill, ed., and Jan Heering, ed. Jun. 1984 49 p refs
(ISSN-0168-826x) Avail: NTIS HC A03/MF A01

The B programming language; computer aided typesetting; and multigrid algorithms for solving elliptic differential equations on supercomputers are discussed. For individual titles, see N86-21174 through N86-21176.

N86-21174# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
THE B PROGRAMMING LANGUAGE AND ENVIRONMENT
Steven Pemberton *In its* CWI Newsletter Jun. 1984 p 2-14 refs (For primary document see N86-21173 11-61)
Avail: NTIS HC A03/MF A01

The B programming language, designed to replace BASIC, is described. It is a high level language, avoiding the need to build up long sets of commands as in BASIC. It is intended for use on personal computers by nonprofessional programmers. Since user-written programs are called in exactly the same way as built-in B commands, much of the need for a separate command language disappears. Variables serve as files, and since programs are the equivalent of subroutines in other languages, parameters can be passed to programs using the normal parameter passing mechanism of subroutines. Author (ESA)

N86-21175# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
TYPESETTING AT THE CENTER FOR MATHEMATICS AND COMPUTER SCIENCE (CWI), PART 1 **c60**
Jaap Akkerhuis *In its* CWI Newsletter Jun. 1984 p 15-24 refs
(For primary document see N86-21173 11-61)
Avail: NTIS HC A03/MF A01

The computer assisted typesetting of scientific reports is illustrated. Author (ESA)

N86-21176# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
MULTIGRID ALGORITHMS RUN ON SUPERCOMPUTERS
P. W. Hemker *In its* CWI Newsletter Jun. 1984 p 25-30 refs
(For primary document see N86-21173 11-61)
Avail: NTIS HC A03/MF A01

Multigrid methods to solve elliptic partial differential equations are introduced. Implementation of the algorithms on supercomputers is described. Author (ESA)

N86-21177# University of Southern California, Marina del Rey. Information Sciences Inst.
A BASIC GUIDE TO UNIX
L. Moses Oct. 1985 72 p
(Contract MDA903-81-C-0335)
(AD-A160364; ISI/TM-85-157) Avail: NTIS HC A04/MF A01 CSCL 09/2

This is an introductory document of UNIX on the ISI VAX machines. It is intended for people who would like to use UNIX for electronic mail, text editing, and document preparation, but who may not have experience with UNIX or with programming. It does not include an in-depth explanation of the programs covered; instead, it is a guide to the basic commands. This basic instructional manual introduces the use of several programs that are used on the DARPA sponsored UNIX 4.2 bsd computer systems at USC/Information Sciences Institute. The programs covered include the CCA Emacs text editor, the MH/HM nad MM message programs, the Scribe formatting program, and some csh and Tcsh commands. This manual is intended for people who may not have experience with UNIX or with programming. GRA

N86-21178# Mississippi State Univ., Mississippi State. Dept. of Astrophysics and Aerospace Engineering.
WESSEL: CODE FOR NUMERICAL SIMULATION OF TWO-DIMENSIONAL TIME-DEPENDENT WIDTH-AVERAGED FLOWS WITH ARBITRARY BOUNDARIES Final Technical Report, Jun. 1979 - Sep. 1983
Joe F. Thompson and Robert S. Bernard Aug. 1985 59 p
(Contract DACW39-78-C-0054)
(AD-A160990; WES/TR/E-85-8) Avail: NTIS HC A04/MF A01 CSCL 20/4

The code WESSEL solves the two momentum equations, the energy equation, and the continuity equation on a two-dimensional field with boundaries of arbitrary shape, including multiple inlets, outlets, and obstacles. The basis of this numerical solution is a boundary-fitted curvilinear coordinate system that allows all computation to be done on a rectangular field with a square grid in the transformed plane, regardless of the boundary shape and configuration in the physical plane. The finite difference solution is done in finite volume formulation. The solution is implicit in time, with the difference equations being solved simultaneously by SOR iteration at each time step. The code reads the boundary-fitted coordinate system from the output of the coordinate code WESCOR. The input allows any portions of the boundary (external or obstacles) to be designated as inlets, outlets, no-slip surfaces, or slip surfaces. Arbitrary specification of the variables on inlets and outlets is allowed. The output is in the form of field arrays and plots of the velocity components, pressure, and temperature. All computation is done in metric units, but the input and output units may be specified otherwise. The WESSEL code permits analysis of hydrodynamics for a variety of applications to Civil Works projects. GRA

N86-21179# Air Force Logistics Command, Wright-Patterson AFB, Ohio.
DATA PREPARATION USING LOTUS AND OTHER SPREADSHEETS
Ronnie E. Cooper Sep. 1985 12 p Presented at 19th Annual Department of Defense Cost Analysis Symposium, Leesburg, Virg, 17-20 Sep. 1985
(AD-A160995) Avail: NTIS HC A02/MF A01 CSCL 09/2

A data preparation which uses LOTUS and other spread sheets is presented. The following items are discussed: introduction to spreadsheet use; distributed processing - someone preprocesses the needed data; comparisons - why use a spreadsheet or a program; spreadsheet preparation - general principles; documentation - organizing all that information; data types, potential errors; data entry - what does it look like; how to compute a weighted average; why and how to structure data; using learning curves; using comparison data; using cost estimating relationships (CER); what is a macro; macro examples and their use in menus; the future of the concept; conclusion. GRA

N86-21180# Illinois Univ., Urbana. Computer Systems Group.
THE EFFECT OF SYSTEM WORKLOAD ON ERROR LATENCY: AN EXPERIMENTAL STUDY
Ram Chillarege and Ravishankar K. Iyer Jan. 1985 27 p
(Contract N00014-84-C-0149)
(AD-A161290; CSG-40; UILU-ENG-85-2202) Avail: NTIS HC A03/MF A01 CSCL 05/8

In this paper we have established a methodology for determining and characterizing error latency. The method is based on real workload data gathered by an experiment instrumented on a VAX 11/780 during the normal workload cycle of the installation. This is the first attempt at jointly studying error latency and workload variations in a full production system. Distributions of error latency were generated by seeding errors under varying workload conditions. A family of error latency distributions so generated illustrate that error latency varies by a 1 to 10 (hours) ratio between high and low workloads. The methods is general and can be applied to any system. GRA

N86-21181# Hughes Aircraft Co., Fullerton, Calif. Ground Systems Group.
AISIM (AUTOMATED INTERACTIVE SIMULATION MODELING SYSTEM) VAX VERSION TRAINING MANUAL Final Report
S. Kneeburg, V. Allerton, and T. Woodcock Feb. 1985 155 p
(Contract F33615-81-C-5098)
(AD-A161436; ESD-TR-85-129) Avail: NTIS HC A08/MF A01 CSCL 09/2

This training manual presupposes virtually no programming experience and is intended to provide step by step information necessary to begin using AISIM as hosted on a VAX 11/780. It is not intended as a complete account of the system, and many topics covered in the companion AISIM User's Manual are covered here in less detail, or not at all. For further details on the operation of AISIM or on the kind of simulation AISIM is adapted to, the reader is referred to the more detailed AISIM User's Manual. This manual consists of seven sections. This first section provides a brief overview of AISIM and its main concepts. Sections 2, 3, and 4 concern the Design User Interface (DUI), i.e., that part of AISIM in which models are created. Section 5 describes the complete construction of a simple model. Section 6 turns to the use of the Analysis User Interface--the part of AISIM where simulation and analysis occur--using the model developed in Section 5 as an

example. Finally, Chapter 7 will document the creation, simulation and analysis of a more complex system. GRA

N86-21182# Utah Univ., Salt Lake City. Dept. of Computer Science.
DISCRETE B-SPLINES AS AN APPROACH TO COMPUTER AIDED GEOMETRIC DESIGN Final Report, 1 Jul. 1981 - 31 Dec. 1984
Richard F. Riesenfeld and Elaine Cohen Sep. 1985 8 p
(Contract DAAG29-81-K-0111)
(AD-A161445; ARO-18092.8-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

Investigations have been made of many interesting problems deriving from the applications of discrete splines to the problems of computer aided geometric design. New theory and algorithms have been developed and support mechanisms based on the Oslo algorithm have been incorporated in order to help use the geometry model directly to calculate many geometric attributes needed for the design process including surface rendering and intersections. Author (GRA)

N86-21183# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
CONCURRENT PROGRAMMING USING ACTORS: EXPLOITING LARGE-SCALE PARALLELISM
Gul Agha and Carl Hewitt 7 Oct. 1985 22 p
(Contract N00014-80-C-0505)
(AD-A162422; AI-M-865) Avail: NTIS HC A02/MF A01 CSCL 09/2

We argue that the ability to model shared objects with changing local states, dynamic reconfigurability, and inherent parallelism are desirable properties of any model of concurrency. The actor model addresses these issues in a uniform framework. This paper briefly describes the concurrent programming language Act3 and the principles that have guided its development. Act3 advances the state of the art in programming languages by combining the advantages of object-oriented programming with those of functional programming. We also discuss considerations relevant to large-scale parallelism in the context of open systems, and define an abstract model which establishes the equivalence of systems defined by actor programs. Author (GRA)

N86-21184# Boeing Aerospace Co., Seattle, Wash.
SPECIFICATION TECHNOLOGY GUIDEBOOK Final Report, Mar. 1984 - Mar. 1985
David R. Addleman, Margaret J. Davis, and P. E. Presson Aug. 1985 238 p
(Contract F30602-84-C-0073)
(AD-A162457; RADC-TR-85-135) Avail: NTIS HC A11/MF A01 CSCL 09/2

The Specification Technology Guidebook provides guidelines for the selection of requirements and design specification methodologies appropriate to various software development environments and various types of software. The guidelines cover the requirements analysis architectural and detailed design phases. These guidelines are incorporated in a table-driven format that define increasingly thorough and formal levels of specification based on a software project's significance level. Significance level measures the relative importance of an individual project based on considerations of quality, software, and project. The guidebook provides summary descriptions of specification methodologies. It includes a method for selecting automated tools to support the selected methodologies. It includes typical paragraphs that can be included in Air Force software development statements-of-work to specify the use of specification methodologies by the contractor during the requirements analysis and design phases of a contracted development. Three example problems for C3I software development projects are included. A primary consideration imposed on each example is compatibility with the Ada programming language. The other considerations used for system requirements and design of the C3I problems were derived from actual requirements set forth in C3I RFP's, and working knowledge of the requirements for C3I software and system projects gained by Boeing Aerospace engineers during the last decade. GRA

N86-21185# Naval Ocean Research and Development Activity, Bay St. Louis, Miss.
GEONAMES PROCESSING SYSTEM FUNCTIONAL DESIGN SPECIFICATION. VOLUME 1: AUTOMATED ALPHANUMERIC DATA ENTRY SYSTEM Final Report
Gail Langran, Anne Downs, Barry Glick, and Warren Schmidt Mar. 1985 29 p
(AD-A162458; NORDA-98-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 09/2

This report describes the Geonames Processing System attributes and serves as a basis for understanding between the user and the developer. The subsystems referred to are: Advanced Symbol Processing, Advanced Type Placement, Geographic Names Data Base, and Automated Alphanumeric Data Entry System (AADES). The Automated Alphanumeric Data Entry System described in this volume will provide DMA with a means of high-volume geonames data entry from map sources. Source maps will include DMA map series and non-DMA maps (foreign and domestic). Captured information will be stored in a sequential file to be merged with the Geographic Names Data Base (GNDB). This file will include information on the geoname (specific and generic components, if applicable), the position of the feature to which the name refers, the feature's designator or class, the source document, the country (or countries) the named feature is in, the feature's attributes, and the non-Romanized name (if applicable). GRA

N86-21186# Argonne National Lab., Ill.
THREE COMPUTER CODES FOR SAFETY AND STABILITY OF LARGE SUPERCONDUCTING MAGNETS
L. R. Turner 1985 9 p Presented at the Cryogenic Engineering Conference and International Cryogenic Materials Conference, Boston, Mass., 12 Aug. 1985
(Contracts DE-AC07-76ID01570; W-31-109-eng-38)
(DE85-018444; CONF-850814-10) Avail: NTIS HC A02/MF A01

For analyzing the safety and stability of large superconducting magnets, three computer codes TASS, SHORTURN, and SSICC have been developed, applicable to bath-cooled magnets, bath-cooled magnets with shorted turns, and magnets with internally cooled conductors, respectively. The TASS code is described, and the use of the three codes is reviewed. DOE

N86-21187# Argonne National Lab., Ill.
COMPONENT CONFIGURATION CONTROL SYSTEM: AN APPLICATION OF LOGIC PROGRAMMING
R. C. Stratton and G. G. Town 1985 9 p Presented at the Artificial Intelligence in Engineering Conference, Washington, D.C., 21 Oct. 1985 Prepared in cooperation with Central Washington Univ., Ellensburg
(Contract W-31-109-eng-38)
(DE85-018455; CONF-8510161-1) Avail: NTIS HC A02/MF A01

A computer application system is described which provides nuclear reactor power plant operators with an improved decision support system. This system combines traditional computer applications such as graphics display with artificial intelligence methodologies such as reasoning and diagnosis so as to improve plant operability. This paper discusses the issues, and a solution, involved with the system integration of applications developed using traditional and artificial intelligence languages. DOE

N86-21188# Allied Bendix Aerospace, Kansas City, Mo.
SOLID MODELING AND IGES
N. C. Christensen Sep. 1985 4 p Presented at the Solid Modeling 1985: Making CAD/CAM Pay Back, San Francisco, Calif., 6 Oct. 1985
(Contract DE-AC04-76DP-00613)
(DE86-000528; BDX-613-3366; CONF-8510171-1) Avail: NTIS HC A02/MF A01

The current status of IGES as concerns solid modeling is described. Covered are the activities of the IGES Solids Committee,

planned solids capability for IGES and IGES-PDES by December 1986. One of the key requirements of CIM is data integration. Data are entered once and then made available to all applications. IGES was developed to allow communication of CAD data between different vendor's systems. Originally the requirement was to communicate drawings. IGES Version 3.0 due in October 1985 contains no capability to communicate solids. But as industry moves toward the use of solids, the IGES Committee has been preparing to meet the foreseen need for solids. DOE

N86-21189# California Univ., Los Angeles. School of Engineering and Applied Science.
USE OF LOGIC FLOWGRAPH MODELS IN A COMPUTER AIDED PROCESS ANALYSIS AND MANAGEMENT SYSTEM
S. B. Guarro and D. Okrent Jul. 1985 12 p refs Presented at the International Topical Meeting on Computer Applications for Nuclear Power Plant Operation and Control, Pasco, Wash., 8 Sep. 1985 Prepared in cooperation with Lawrence Livermore National Lab., Calif. Calif.
(Contract W-7405-eng-48)
(DE86-000740; UCRL-93293; CONF-850903-22) Avail: NTIS HC A02/MF A01

The development of a multi-function computer-aided process analysis and management (CAPAM) system, to be implemented in nuclear power plant control rooms, is proposed and discussed. The design goals identified for such a system are early disturbance detection and diagnosis, accompanied by identification of the best possible recovery actions or alternative success paths. The CAPAM structure is articulated in three functional levels with dedicated CRT displays. Increasing amount of diagnostic or recovery information is made available to the operators at the lower display levels. Probabilistic safety margins to the loss of important safety functions may be also calculated. The proposed implementation of the CAPAM concept is based on the use of logic flowgraph networks for the more detailed system modeling. Examples of such an implementation are given. DOE

N86-21190# Los Alamos National Lab., N. Mex.
TRAC-PF1 CODE VERIFICATION WITH DATA FROM THE OTIS TEST FACILITY
M. T. Childerson and R. K. Fujita 1985 18 p Presented at the American Society of Mechanical Engineers Winter Annual Meeting, Miami, Fla., 17 Nov. 1985
(Contract W-7405-eng-36)
(DE85-010709; LA-UR-85-1265; CONF-851125-1) Avail: NTIS HC A02/MF A01

A computer code (TRAC-PF1/MOD1) developed for predicting transient thermal and hydraulic integral nuclear steam supply system (NSSS) response was benchmarked. Post-small break loss-of-coolant accident (LOCA) data from a scaled, experimental facility, designated the One-Through Integral System (OTIS), were obtained for the Babcock and Wilcox NSSS and compared to TRAC predictions. The OTIS tests provided a challenging small break LOCA data set for TRAC verification. The major phases of a small break LOCA observed in the OTIS tests included pressurizer draining and loop saturation, intermittent reactor coolant system circulation, boiler-condenser mode, and the initial stages of refill. The TRAC code was successful in predicting OTIS loop conditions (system pressures and temperatures) after modification of the steam generator model. In particular, the code predicted both pool and auxiliary-feedwater initiated boiler-condenser mode heat transfer. DOE

N86-21191# Oak Ridge National Lab., Tenn.
APPLICATIONS GUIDE TO THE RSIC-DISTRIBUTED VERSION OF THE MCNP CODE (COUPLED MONTE CARLO NEUTRON-PHOTON CODE)
S. N. Cramer Sep. 1985 25 p
(Contract DE-AC05-84OR-21400)
(DE86-001370; ORNL/TM-9641) Avail: NTIS HC A02/MF A01

An overview of the RSIC-distributed version of the MCNP code (a coupled Monte Carlo neutron-photon code) is presented. All general features of the code, from machine hardware requirements to theoretical details, are discussed. The current nuclide cross-section and other libraries available in the standard code package are specified, and a realistic example of the flexible geometry input is given. Standard and nonstandard source, estimator, and variance-reduction procedures are outlined. Examples of correct usage and possible misuse of certain code features are presented graphically and in standard output listings. Finally, itemized summaries of sample problems, various MCNP code documentation, and future work are given. DOE

N86-21192# Oak Ridge National Lab., Tenn.
APPLICATIONS GUIDE TO THE RSIC-DISTRIBUTED VERSION OF THE KENO-V CODE
S. N. Cramer Sep. 1985 24 p
(Contract DE-AC05-84OR-21400)
(DE86-001373; ORNL/TM-9642) Avail: NTIS HC A02/MF A01

A review of the KENO-V multigroup Monte Carlo criticality code available from the Radiation Shielding Information Center (RSIC) at Oak Ridge National Laboratory (ORNL) is presented. All aspects of the code are discussed, including the stand-alone and SCALE system modules and the applicable computer hardware systems. The cross-section requirements are outlined, and the available code package libraries and other necessary data are defined. The supergroup feature for use of the code on small computer systems is explained. The capabilities and limitations of the KENO array geometry description are illustrated. Various aspects of the random-walk and estimation procedures are itemized. Examples of the various calculated values of k/sub eff/ and its statistical uncertainty are shown in standard output listings. Finally, a summary of sample problems and future work is given. DOE

N86-21193# Geological Survey, Menlo Park, Calif.
AUTOMATIC PROGRAM FOR THE INTERPRETATION OF TWO-DIMENSIONAL GRAVITY AND MAGNETIC ANOMALIES
A. Wagini 1985 70 p refs
(Contract DE-AI08-78ET-44802)
(DE86-001418; USGS-OFR-85-377) Avail: NTIS HC A04/MF A01

This automatic inversion program for the interpretation of two-dimensional gravity and magnetic anomalies has been developed mainly in support of the US Geological Survey's effort to characterize potential radioactive-waste storage sites at the Nevada Test Site, Nevada. The method presented minimizes the sum of the squares of the residuals by varying only one variable (coordinate) at a time. This allows one to use all available information in the model calculation, which can reduce the computation time. The objective of this program is to find the shape of geologic bodies when the physical parameters are known. Except for the outermost corners, only the z-coordinate of each corner-point is varied. The variation of only one variable at a time has the advantage that a large number of bodies and corner-points (in this program up to 50 bodies, each with up to 50 corner-points) can be used for the model calculation without solving a large matrix. DOE

N86-21194# Technische Hogeschool, Delft (Netherlands). Lab. voor Geotechniek.
RESOLVING LINEAR EQUATIONS ON A MICROCOMPUTER [OPLOSSING VAN LINEAIRE VERGELIJKINGEN OP EEN MICROCOMPUTER]
A. Verruijt 1985 24 p In DUTCH
(Stumico-Rept-1) Avail: NTIS HC A02/MF A01

Algorithms to resolve systems of N linear equations with N unknowns numerically on microcomputers with limited memory capacity are presented. As a condition, the describing matrices are supposed to be sparse; i.e., many zeros and mostly symmetric. Iterative methods (Gauss-Seidel, or a variation) as well as direct methods (Gauss elimination with a wave front technique) are discussed. The methods are illustrated with the standard problem of a network of electrical resistances. The programs were written in BASIC for microcomputers with an OPTION BASE 1 possibility. Author (ESA)

N86-21195# Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.
COPWAL, AN ALGOL PROCEDURE FOR CONSTRAINED OPTIMIZATION BY MEANS OF AUGMENTED LAGRANGE FUNCTIONS
C. deWit Oct. 1983 22 p
(RC-TWA-83001) Avail: NTIS HC A02/MF A01

An Algol procedure which is more efficient than penalty function methods in constrained optimization using augmented Lagrange functions is presented. Author (ESA)

N86-21196# Technische Hogeschool, Delft (Netherlands). Lab. for Technical Physics.
COMPUTER SIMULATION OF THE CHARGE DISTRIBUTION AS A RESULT OF ION IMPACT IN THE MULTIWIRE PROPORTIONAL WIRE CHAMBERS BY MEANS OF A MULTIPARTICLE MODEL ON A SUPERCOMPUTER [CUMPUTERSIMULATIE VAN DE LADINGSVERDELING T.G.V. INFLUENTIE IN DE DRADENKAMER MET EEN VEEL DEELTJES MODEL OP EEN SUPERCOMPUTER]
J. P. Wagenaar Apr. 1983 55 p refs In DUTCH; ENGLISH summary
Avail: NTIS HC A04/MF A01

The calculation of the induced electric charge on the conductors of a multiwire proportional wire chamber was evaluated. Analytical solution of the Poisson equation; numerical solution of the Poisson equation using the variation principle of Hamilton; and the multiparticle approach using Coulombs' law were evaluated. Optimization of the program for a CDC CYBER 205 computer is discussed. Author (ESA)

N86-21197# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering
EVALUATION OF THE CYBER 205 VECTOR PROGRAMMING COURSE
J. H. vanDijk and J. W. deHeer Dec. 1984 18 p refs Course held in Amsterdam, 23-26 Oct. 1984; sponsored by Amsterdam Universities Computing Center and Utrecht Academic Computing Center
(Contracts STW-DRL-14.0120; PBE-90753.140)
(VTH-M-529) Avail: NTIS HC A02/MF A01

Participants' impressions of a CYBER 205 vector programming course are outlined. Author (ESA)

N86-21198# Technische Hogeschool, Eindhoven (Netherlands). Working Group on Software.
AN INVENTORY OF BASIC SOFTWARE FOR COMPUTER AIDED CONTROL SYSTEM DESIGN (CACSD), PRELIMINARY VERSION
12 Jul. 1985 57 p refs
(WGS-85-1) Avail: NTIS HC A04/MF A01

Over 1200 subroutines that may be considered as basic routines for solving problems in control and system theory are listed. Author (ESA)

N86-21199# Groningen Rijksuniversiteit (Netherlands). Rekencentrum.
THE CREATION OF A VIRTUAL NAG-ALGOL68 PROGRAM LIBRARY
R. deBruin and C. G. vanderLaan 1983 25 p refs
Avail: NTIS HC A02/MF A01

A method for the creation of a virtual ALGOL68 program library over the NAG-FORTRAN Subset Library is discussed. The virtual ALGOL68 library and the intermediate FORTRAN library are listed. Author (ESA)

N86-21200# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Computer Science Dept.
THE B NEWSLETTER, ISSUE 3, JAN. 1985
Jan. 1985 14 p refs
Avail: NTIS HC A02/MF A01

Implementation of the B programming language on the IBM PC; a file maintenance program; a proposal for matrix/vector functions in B; and efforts to speed up B implementation are covered. Author (ESA)

N86-21201# National Bureau of Standards, Gaithersburg, Md. Center for Applied Mathematics.
GLOBAL SOLUTIONS TO FACTORABLE NONLINEAR OPTIMIZATION PROBLEMS USING SEPARABLE PROGRAMMING TECHNIQUES
G. P. McCormick Jul. 1985 46 p
(PB86-105988; NBSIR-85/3206) Avail: NTIS HC A03/MF A01 CSCL 12B

Many algorithms for obtaining global solutions to nonconvex optimization problems have been proposed in recent years. The methods farthest along computationally are those for separable problems. These use linear programming codes to solve sequences of LP problems formed from piece-wise linear approximations to the nonlinear functional forms. For a large class of optimization problems, called factorable programming problems, it is possible to create equivalent separable problems. This is done at a cost: additional variables and constrains. In this paper the procedure for creating the equivalent separable problems is outlined and a brief description is given of a global solution algorithm due to Falk. A small example is given illustrating the above techniques. The example is also solved using a more direct method. Application to the solution of nonlinear least squares is illustrated with another example. Areas of research or improving the efficiency of this approach are also discussed. GRA

N86-20403# Newcastle-upon-Tyne Univ. (England). Computing Lab.
SOFTWARE FAULT TOLERANCE EXPERIMENTS
T. Anderson and P. A. Barrett *In* AGARD Fault Tolerant Hardware/Software Architecture Sep. 1985 5 p refs Sponsored in part by UK Science and Engineering Research Council and by the Ministry of Defence (For primary document see N86-20399 11-08)
Avail: NTIS HC A07/MF A01

N86-20404# Newcastle-upon-Tyne Univ. (England). Computing Lab.
CAN DESIGN FAULTS BE TOLERATED?
T. Anderson *In* AGARD Fault Tolerant Hardware/Software Architecture Sep. 1985 5 p refs (For primary document see N86-20399 11-08)
Copyright. Avail: NTIS HC A07/MF A01

N86-20406# Honeywell Systems and Research Center, Minneapolis, Minn.
MULTI-COMPUTER FAULT TOLERANT SYSTEMS USING ADA
Walter L. Heimerdinger *In* AGARD Fault Tolerant Hardware/Software Architecture Sep. 1985 8 p refs (For primary document see N86-20399 11-08)
Avail: NTIS HC A07/MF A01

62 COMPUTER SYSTEMS

Includes computer networks.

N86-21202# Koninklijke Inst. van Ingenieurs, The Hague (Netherlands). Afdeling/Sectie Informatietechniek.
NATIONAL LAN-DAY. IN SEARCH OF THE PROMISED LAN [NATIONALE LAN-DAG. OP ZOEK NAAR HET BELOOFDE LAN]
5 Mar. 1985 188 p refs Partly in DUTCH and ENGLISH Conf. held in Utrecht, Netherlands, 5 Mar. 1985
Avail: NTIS HC A09/MF A01

Local Area Network (LAN) selection criteria for setup and acquisition were outlined. Problems around cables and topology were discussed. Standardization possibilities of LAN (interfaces) were indicated. The LAN'S were compared with telecommunication in general. Security possibilities were examined. Four examples of LAN in operation were given. A flexible LAN, implemented with

fourth generation software tools, was presented. For individual titles, see N86-21203 through N86-21214.

N86-21203# Tele-Consulting G.m.b.H., Gaeufelden (West Germany).
HOW TO SELECT AND IMPLEMENT A LOCAL AREA NETWORK
Dieter Steinle *In* Koninklijk Inst. van Ingenieurs Nationale LAN-Day. In Search of the Promised LAN 5 Mar. 1985 42 p (For primary document see N86-21202 11-62)
Avail: NTIS HC A09/MF A01

Based on the market situation and its driving forces, the question of how a Local Area Network (LAN) user can specify, select, and implement a suitable solution for an (office) environment is treated. Main LAN functions in relation to the user needs were summarized. Network design criteria and main requirements of a LAN, were specified. Elements for a request for price quotation were given. A selection process was outlined and prerequisites for a successful LAN project were outlined. Author (ESA)

N86-21204# Shell Internationale Petroleum Maatschappij B.B. (Netherlands).
THE PLACE OF LOCAL AREA NETWORKS (LAN) IN LARGE ORGANIZATIONS
J. A. Robinson *In* Koninklijk Inst. van Ingenieurs Nationale LAN-Day. In Search of the Promised LAN 5 Mar. 1985 6 p (For primary document see N86-21202 11-62)
Avail: NTIS HC A09/MF A01

The Shell UK telecommunication network developed for voice and data transmission is described. Services and protocols to be carried, i.e., TV channels, voice channels, and digital data, were surveyed and brought as an argument for a broadband network. Basic network properties, i.e., intersite links, logical numbering, duplicated equipment and alternate routing, and the network control centers (NCC) are described. Difficulties related to the dimensions of the network, i.e., over-strained NCC's and autonomy ambitions of different groups of people in the net are discussed.
Author (ESA)

N86-21205# Europe Container Terminus B.V., Rotterdam (Netherlands).
DATA COMMUNICATION SYSTEMS OF EUROPE CONTAINER TERMINUS BV IN ROTTERDAM (THE NETHERLANDS) [DATACOMMUNICATIESYSTEMEN VAN EUROPE CONTAINER TERMINUS B.V. IN ROTTERDAM]
R. J. M. vanEyndhoven *In* Koninklijk Inst. van Ingenieurs Nationale LAN-Day. In Search of the Promised LAN 5 Mar. 1985 6 p In DUTCH (For primary document see N86-21202 11-62)
Avail: NTIS HC A09/MF A01

The data communication network of a container transhipment company is described. Operational processes at the terminal are controled by a network including a double Burroughs mainframe in which decentralized processing on micro and minicomputers is applied. Techniques implemented are: high-speed multiplexing, Ethernet, and wireless communication via radio and infrared. By means of 128 infrared transmitter receivers placed in the terrain, the exchange of information between the straddlecarriers and the terminal is provided. The load planning of the ships is carried out by a computer aided ship planning system. Via double statistical multiplexers the data transmission between the docks terminal and the two other terminals is provided. Author (ESA)

N86-21206# Philips International B.V., Eindhoven (Netherlands). Product Div. Telecommunications Systems.
STANDARDIZATION OF LOCAL AREA NETWORKS (LANS): LAN SERVICE AND LAN INTERFACE [STANDAARDISATIE VAN LAN'S, LAN SERVICE EN LAN INTERFACE]
J. vanEgmond *In* Koninklijk Inst. van Ingenieurs Nationale LAN-Day. In Search of the Promised LAN 5 Mar. 1985 12 p refs In DUTCH (For primary document see N86-21202 11-62)
Avail: NTIS HC A09/MF A01

Definition and standardization possibilities of a LAN technology independent interface within the Open Systems Interconnection Basic Reference Model were investigated. This standard interface would enable a simple connection between terminals and LAN's of different manufacturers. The importance with regard to future communication-integrated LAN's, providing for the communication in one building or complex, was emphasized. More kinds of communication on one LAN means the aptness of the LAN for the transport of data blocks and continuous data streams.
Author (ESA)

N86-21207# Electrical Engineering Nederland (Netherlands).
(COMMUNICATION) CABLE ASPECTS [BEKABELINGSASPECTEN]
H. Walgemoed *In* Koninklijk Inst. van Ingenieurs Nationale LAN-Day. In Search of the Promised LAN 5 Mar. 1985 13 p In DUTCH (For primary document see N86-21202 11-62)
Avail: NTIS HC A09/MF A01

Cable aspects of Local Area Networks are discussed. A clearly structured unity is lacking, because there are hardly any norms in computer cabling. A comparison with telephone cabling shows the practibility of a star topology network with distributors. The advantages of ring nets and bus nets and their sensitivity to disturbances are discussed. The advantages of the use of fiber optic cables are summarized. Author (ESA)

N86-21208# Posterijen, Telegrafie en Telefonie, The Hague (Netherlands).
A POST, TELEGRAPH AND TELEPHONE (PTT) VIEW ON LOCAL COMMUNICATION [EEN PTT VISIE OP LOKALE COMMUNICATIE]
P. C. J. Hamelberg *In* Koninklijk Inst. van Ingenieurs Nationale LAN-Day. In Search of the Promised LAN 5 Mar. 1985 10 p In DUTCH (For primary document see N86-21202 11-62)
Avail: NTIS HC A09/MF A01

Local Area Networks (LAN) are considered within wider telecommunications. Possible kinds of telecommunication and demands are discussed. Developments in public telecommunication infrastructure are illustrated as there are marked parallels between local communication and the public infrastructure.
Author (ESA)

N86-21209# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands). Ground Data Handling Section.
ADVANCED LOCAL AREA NETWORK (LAN) APPLICATION AT ESTEC: LAN APPLICATION WITHIN A TEST SYSTEM FOR SPACECRAFT [GEAVANCEERDE LAN TOEPASSINGEN BIJ ESTEC. LOCAL AERA NETWORK TOEPASSING BINNEN EEN TEST SYSTEM VOOR RUIMTEVAARTUIGEN]
W. F. M. vanLeeuwen *In* Koninklijk Inst. van Ingenieurs Nationale LAN-Day. In Search of the Promised LAN 5 Mar. 1985 5 p In DUTCH (For primary document see N86-21202 11-62)
Avail: NTIS HC A09/MF A01

The application of a LAN as part of the Overall Check-Out Equipments (OCOE) used during the integration and afterwards during the test programs of the Giotto spacecraft is described. Specific functions of the OCOE and the place and necessity of the LAN within it are discussed. Based on the network requirements, the SYTEC Localnet 20/CATV combination was chosen. Areas in which implantation problems occurred, e.g., effective data transmission, components (splitters and taps), network start and control, intercom, and color image quality are discussed.
Author (ESA)

N86-21210# Philips Data Systems B. V., Apeldoorn (Netherlands).
SELECTION CRITERIA FOR LOCAL AREA NETWORKS (LANS) [SELECTIECRITERIA VOOR LAN'S]
A. Hazeleger *In* Koninklijk Inst. van Ingenieurs Nationale LAN-Day. In Search of the Promised LAN 5 Mar. 1985 27 p In DUTCH (For primary document see N86-21202 11-62)
Avail: NTIS HC A09/MF A01

Selection criteria for the acquisition fo a LAN are presented. Application relevant alternatives were related to the organization desires (the environment). Material, i.e., PABX, base and broad-

band, and optical fiber LAN's are described. Time and frequency multiplexing are considered. Arbitration methods i.e., TDMA, CSMA/CD, and Token passing are discussed. Limitations, e.g., connector prices, distances bridged, portability, and extension possibilities are depicted. Standardization is reviewed.
Author (ESA)

N86-21211# IHBO de Maere, Enschede (Netherlands). HIO Afdel.
MANUS, A FOURTH GENERATION LOCAL COMPUTER NETWORK [MANUS, EEN VIERDE GENERATIE LOKAAL COMPUTERNETWERK]
Theo deRidder *In* Koninklijk Inst. van Ingenieurs Nationale LAN-Day. In Search of the Promised LAN 5 Mar. 1985 6 p refs In DUTCH (For primary document see N86-21202 11-62)
Avail: NTIS HC A09/MF A01

The MAere Net of Unix Systems was developed and implemented with fourth generation software tools, as available in UNIX environments. Complete transparency on users level as well as facilities for an automated and fault-tolerant network are offered. Every control task, such as back-ups, or the management of configuration changes, is distributed and is as such not dependent upon a specific network joint. Author (ESA)

N86-21212# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
EXPERIENCE WITH A LOCAL AREA NETWORK (LAN) AT THE CENTER FOR MATHEMATICS AND COMPUTER SCIENCE (CWI)
Jim McKie *In* Koninklijk Inst. van Ingenieurs Nationale LAN-Day. In Search of the Promised LAN 5 Mar. 1985 5 p (For primary document see N86-21202 11-62)
Avail: NTIS HC A09/MF A01

A computing environment and reasons for the choice of Ethernet and the Transmission Control Protocol/Internet Protocol are given. Experience with the hardware and software and how the LAN changed user practices are outlined. Author (ESA)

N86-21213# Klynveld Kraayenhof and Co., Amsterdam (Netherlands).
SECURITY IN LOCAL AREA NETWORKS (LANS) [BEVEILIGING IN LOKALE NETWERKEN]
H. A. J. M. Spape *In* Koninklijk Inst. van Ingenieurs Nationale LAN-Day. In Search of the Promised LAN 5 Mar. 1985 8 p refs In DUTCH (For primary document see N86-21202 11-62)
Avail: NTIS HC A09/MF A01

Computer information security problems of Local Area Networks (LAN's) are discussed in relation to the IEEE-802 standard where the condition of open systems with high connectivity is defined. The transmission line used, i.e., twisted pair, fiber optic, and coaxial cable (base and broadband); topology, i.e., star, ring, or bus; and the IEEE-Logical Link Control, i.e., unacknowledged connectionless, connection oriented, and acknowledged connectionless service are considered. The LAN's as defined by the IEEE-802 standard, hardly provide any security. Author (ESA)

N86-21214# Gemeentelijk Centrum voor Electronische Informatieverwerking, Amsterdam (Netherlands).
DOES A LOCAL AREA NETWORK (LAN) SOLVE YOUR CABLE PROBLEMS [LOST EEN LAN UW BEKABELINGSPROBLEEM OP]
P. Wester *In* Koninklijk Inst. van Ingenieurs Nationale LAN-Day. In Search of the Promised LAN 5 Mar. 1985 12 p In DUTCH (For primary document see N86-21202 11-62)
Avail: NTIS HC A09/MF A01

Possibilities of installing a Local Area Network (LAN) cable system in a building to be constructed were investigated. The building has 5 floors, 1200 working places, and considerable processing equipment. The usefulness of a LAN versus conventional ad hoc and IBM standard cable was examined. The multifunctional IBM cable system, and five LAN's, i.e., Digital Ethernet, Localnet of Syntec, Net/one of Ungerman-Bas, Planet of Racal-Milgo, and Sopholon of Philips, were asked to make an offer based on a definition study. It is suggested that present LAN's do not solve the problem (which is better solved by the IBM system); and conventional cable is much cheaper.
Author (ESA)

N86-21215# Wisconsin Univ., Madison. Mathematics Research Center.
WHAT KIND OF WORKSTATION SHOULD I BUY? SEVEN-FOLD CRITERIA FOR HARDWARE AND SOFTWARE Technical Summary Report
L. R. Scott Jul. 1985 13 p
(Contract DAAG29-80-C-0041)
(AD-A160985; MRC-TSR-2840) Avail: NTIS HC A02/MF A01 CSCL 05/5

The problem of designing a workstation suitable for an individual scientist or group of scientists are addressed from an abstract point of view. A set of seven criteria concerning hardware are presented that should be considered when assessing one's needs and comparing various available products. Seven categories of software are also discussed that are critical for someone doing code development, testing and production runs on a remote computer (mainframe or supercomputer). The criteria discussed are intended to be a model checklist relevant especially for people doing code development and production work in scientific computation. After discussing criteria for evaluating workstations, two examples are given of inexpensive yet powerful systems that should be possible to assemble today. Author (GRA)

N86-21216# Lawrence Livermore National Lab., Calif.
SUPERCOMPUTER: A FRIENDLY TOOL ON THE SCIENTIST'S DESK
D. Fuss 1985 12 p Presented at the SHARE European Association Meeting, Zurich, Switzerland, 23 Sep. 1985
(Contract W-7405-eng-48)
(DE86-001581; UCRL-93357; CONF-8509182-1) Avail: NTIS HC A02/MF A01

Supercomputers are being used in a variety of relatively new applications - airplane design, weather forecasting, oil reclamation, energy research, and structural analysis, to name a few. Thus, the supercomputer is rapidly moving from an exotic tool used by a few experts to the indispensable tool of many researchers. This raises questions about how to make supercomputers easier to use, how to provide access to supercomputers for remote users, and how to maximize the efficiency of both users and supercomputers. This paper discusses some of the trade-offs and provide some points of view, gained through experience, on these issues.
DOE

N86-21217# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
POSSIBILITIES OF THE HP1000 - A900 FOR THE REPLACEMENT OF THE HYBRID COMPUTER OF THE DEPARTMENT OF STABILITY AND CONTROL [DE MOGELIJKHEDEN VAN DE HP1000 - A900 TER VERVANGING VAN DE HYBRIDE REKENMACHINE VAN DE VAKGROEP STABILITEIT EN BESTURING]
E. W. deKeizer and F. L. M. Kok 24 Oct. 1983 6 p refs In DUTCH
(VTH-M-488) Avail: NTIS HC A02/MF A01

As an acquisition alternative for a SEL 32/87, the HP1000 - A900 was tested for its computing (time) capacity. High capacity is required for flight simulation. A benchmark test program was developed. Results of the SEL and the HP, which was equipped with a standard HP FORTRAN 77 compiler, were compared with those of an Amdahl computer. The test was executed using the standard HP Vector Instruction Set (VIS). The HP computer appears to be 2 to 10 times, and 1.5 to 4 times (with VIS) slower than the SEL. Author (ESA)

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N86-21218 Wisconsin Univ., Madison.
OFF-LINE ROBOT PROGRAMMING AND SIMULATION Ph.D. Thesis
Mark Lawrence Hornick 1985 193 p
Avail: Univ. Microfilms Order No. DA8512304

The fundamental aspects of offline robot programming and simulation through computer modelling of the robot and its workspace environment are discussed. The advantages of the system are described and an overview of the computer program developed for this purpose is outlined. The generalized matrix symbolism used to mathematically describe mechanical linkages is applied to robot manipulators, and the kinematic equation of a robot arm are developed. The dynamic equations of motion are formulated for a manipulator by applying the Lagrange equations in conjunction with the same matrix notation. An efficient recursive formulation for calculation of dynamic joint torques resulting from this development is presented. Methods used for robot motion programming are discussed. A high level programming language is presented which was incorporated into the simulation program. Procedures for generating the actual motion trajectories are discussed, and a method for path generation based upon use of truncated trigonometric series is presented. In the final chapters, the dynamic aspects of robot motions are analyzed, and a method based upon time scaling for optimal determination of motion trajectories for minimum cycle times is presented. The capabilities of the program and the effects of the time scaling process are demonstrated. Dissert. Abstr.

N86-21219# National Aerospace Lab., Tokyo (Japan).
COVARIANCE SPECIFICATION FOR THE LINEAR TIME-INVARIANT OUTPUT-FEEDBACK CONTROL SYSTEMS USING A KALMAN FILTER
Masahiko Nagayasu Oct. 1985 16 p refs In JAPANESE; ENGLISH summary
(NAL-TR-882; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

The covariance specification problem using a Kalman filter for the linear time-invariant output-feedback control system contaminated by observation and system noise is described. Linear stochastic control problems based on the quadratic performance criteria were studied. However, the relationships between the criteria and the behavior of the resultant closed loop system are still in question today. The optimal output-feedback control using a Kalman filter with which the stationary state covariance matrix coincides with the prescribed matrix is described. The system is disturbed by additive white/color system noise and the output signal is contaminated by white observation noise. The dynamic output feedback control system is obtained by using a Kalman filter. The covariance specification problem, i.e., to obtain the optimal feedback gains under the requirement of the state covariance coinciding with the prescribed covariance for minimizing the control effort, is solved. The control problem of an aircraft in atmospheric turbulence is numerically discussed. E.A.K.

N86-21220*# VAIR, Inc., Williamsburg, Va.
IMPLEMENTATION OF ARTIFICIAL INTELLIGENCE RULES IN A DATA BASE MANAGEMENT SYSTEM
Stefan Feyock Feb. 1986 64 p refs
(Contract NAS1-18002)
(NASA-CR-178048; NAS 1.26:178048) Avail: NTIS HC A04/MF A01 CSCL 09B

The intelligent front end prototype was transformed into a RIM-integrated system. A RIM-based expert system was written which demonstrated the developed capability. The use of rules to produce extensibility of the intelligent front end, including the concept of demons and rule manipulation rules were investigated. Innovative approaches such as syntax programming were to be considered. B.G.

N86-21221# Illinois Univ., Urbana. Decision and Control Lab.
ISSUES IN FREQUENCY DOMAIN FEEDBACK CONTROL Ph.D. Thesis
James S. Freudenberg May 1985 416 p
(Contract N00014-84-C-0149)
(AD-A161452; DC-81; UILU-ENG-85-2218) Avail: NTIS HC A18/MF A01 CSCL 09/3

The purpose of this thesis is to examine several issues in the frequency domain theory of feedback control systems. Properties of both single loop and multiple loop systems are considered. For single loop systems the limitations on feedback properties imposed by right half plane poles and zeros of the plant are considered. The relation between open and closed loop properties of multiple loop systems is studied. A great deal of attention is given to how complex analyticity of matrix transfer functions limits feedback properties of multiple loop systems. An integral constraint generalizing Bode's gain-phase relation is presented. Author (GRA)

N86-21222# Lawrence Livermore National Lab., Calif.
ROBUSTNESS OF REDUCED ORDER DECENTRALIZED CONTROL DESIGNS
K. D. Young and D. D. Siljak 28 Aug. 1985 6 p Presented at the 24th IEEE Conference on Decision and Control, Fort Lauderdale, Fla., 11 Dec. 1985 Prepared in cooperation with Santa Clara Univ., Calif.
(Contract W-7405-eng-48)
(DE85-018185; UCRL-93309; CONF-851209-3) Avail: NTIS HC A02/MF A01

Although there have been a great deal of studies in reduced order control designs, the issues relating to the robustness of the resulting controller with respect to distortions in the feedback channels, as well as gain and phase margin, have not been addressed. The robustness of reduced order Linear Quadratic (LQ) design is considered. DOE

N86-21223# Lawrence Livermore National Lab., Calif.
ADAPTIVE CONTROL OF DECENTRALIZED SYSTEMS: KNOWN SUBSYSTEMS, UNKNOWN INTERCONNECTIONS
D. T. Gavel and D. D. Siljak 28 Aug. 1985 9 p Presented at the 24th IEEE Conference on Decision and Control, Fort Lauderdale, Fla., 11 Dec. 1985 Prepared in cooperation with Santa Clara Univ., Calif.
(Contract W-7405-eng-48)
(DE85-018189; UCRL-92417; CONF-851209-4) Avail: NTIS HC A02/MF A01

One of the common assumptions in control of large interconnected systems is that models of subsystems are to a large extent known to a designer, and an essential modeling uncertainty resides in the interconnections. Current decentralized adaptive control schemes take no advantage of this fact. In this paper, an algorithm is presented in which adaptation of local feedback gains is in the direction which compensates for the unknown interconnections, while exploiting the knowledge about the subsystems. As a result, we broaden considerably the class of interconnected systems for which decentralized adaptation is feasible. DOE

N86-21224# Tilburg Univ. (Netherlands). Dept. of Econometrics.
FROM STRUCTURAL FORM TO STATE-SPACE FORM
Max D. Merbis and Aart J. deZeeuw 1985 20 p refs
(FEW-145) Avail: NTIS HC A02/MF A01

Ways to transform an econometric model into state-space form are considered. Consequences of these transformations are that a particular transformation determines the dimension of the resulting state vector, and determines the applicability of systems and control techniques, like optimal feedback control. It appears that both the numbers p and q and the (parsimonious) structure of the ARMA (p,q) model influence the resulting dimension of the state. A considerable reduction can be achieved by elimination of static relationships and reduced stacking. A macroeconometric model consisting of 65 endogenous variables serves as an illustration. Application of a control algorithm might otherwise indicate which transformation is desirable. A choice must be made

between a linear system and a state-space format. For the standard, deterministic, linear quadratic control problem, the optimal trajectories are the same in both cases. Author (ESA)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N86-21225 Washington Univ., Seattle.
QUALITATIVE STABILITY PROPERTIES OF MATRICES Ph.D. Thesis
Terrence M. Bone 1985 69 p
Avail: Univ. Microfilms Order No. DA8521560

A matrix A is sign stable if some matrix with the same sign pattern of positive, negative, and zero entries has all eigenvalues with negative real parts. It is potentially stable if it is not sign unstable. The system $A x + b = 0$ is positively sign solvable if the sign pattern of the solution vector x contains all positive entries and is determined by the sign patterns of A and b. The characterization of potentially stable matrices remains unresolved. Counterexamples are presented refuting some previous results of Quirk and Campbell. New classes of potentially stable matrices are defined by means of recursive constructions, and a new necessary condition for potential stability is given. A characterization is presented of systems $A x + b = 0$ for which A is sign stable and the system is positively sign solvable. This leads to a recognition algorithm of time complexity which is linear in the order of A and the number of nonzero entries of A. The relation between this characterization and previous results of Manber is explored. Dissert. Abstr.

N86-21226 Brown Univ., Providence, R. I.
IS ELASTICITY THE PROPER ASYMPTOTIC THEORY FOR MATERIALS WITH VISCOSITY AND CAPILLARITY Ph.D. Thesis
Jose Luiz Boldrini 1985 99 p
Avail: Univ. Microfilms Order No. DA8519810

The equations for the isothermal motion of a one dimensional unbounded body composed of a material with viscosity (of rate type) and capillarity were considered. Using a technique derived from the Theory of Compensated Compactness, the conditions that guarantee that, as viscosity and capillarity approach zero, the solutions of these equations converge to a solution of the corresponding equations in elasticity was found. Then the structure that viscosity and capillarity impose on shock layers was studied through the asymptotic behavior of traveling wave solutions of the equations of motion. The results that indicate that the conditions that guarantee convergence are indeed necessary. Similar conclusions were reached for material with memory (viscosity of Boltzmann type). Dissert. Abstr.

N86-21227 British Aerospace Aircraft Group, Preston (England). Aircraft Group.
TIME HISTORY RESPONSE OF LINEAR TRANSFER FUNCTION
J. H. McDonnell Aug. 1983 15 p refs
(BAe-MSN-272-Iss-2) Copyright. Avail: Issuing Activity

An algorithm for calculating the time history response y(t) of a linear system to a forcing function f(t), where f(t) and solution y(t) are defined at equally spaced time intervals, is derived. O'Brien's method for reducing to a set of first order differential equations followed by exact solution, assuming that f(t) is represented by straight line segments, is used. A better approximation to f(t) could be made, but not without looking ahead. The method here assumes that yk is calculated as soon as fk is known, that is, without waiting for fk plus 1. The proposed solution method is recommended for any set of linear equations with constant coefficients. The alternative method, while not having the same accuracy, could be more appropriate if the coefficients were variable. Author (ESA)

N86-21228# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Numerical Analysis and Computing Science.
STUDIES IN D-OPTIMAL EXPERIMENTAL DESIGN
Demetre Betsis 1985 18 p refs
(TRITA-NA-8501) Avail: NTIS HC A02/MF A01

The problem of selecting the initial design in iterative computation of the D-optimal design has not been treated previously. A method is suggested here of constructing the initial design. The method yields very good approximations and often the D-optimal design itself. An algorithm for optimal allocation of the masses, is presented and tested. Author

N86-21229# Toronto Univ., Downsview (Ontario). Inst. for Aerospace Studies.
REVIEW OF ADAPTIVE-GRID TECHNIQUES FOR SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS
D. F. Hawken Dec. 1985 36 p refs
(UTIAS-Review-46; ISSN-0082-5247) Avail: NTIS HC A03/MF A01

The results of a literature search for adaptive numerical methods of solving partial differential equations are summarized. The methods discussed involve the adaptive movement of nodes, so as to obtain a low level of solution truncation error while minimizing the number of nodes used in the calculation. Such methods are applicable to the solution of blast wave or other nonstationary flow problems that contain moving regions of rapid change in the flow variables, surrounded by regions of relatively smooth variation. Shock waves, contact surfaces, phase change interfaces, boundary layers, and other structures, can be modelled in detail by these methods. It will be shown that significant economies of execution can be attained if nodes are moved so that they remain concentrated in regions of rapid variation of the flow variables. Author

N86-21230# Montpellier Univ. (France). Lab. de Physique Mathematique.
NONFORMAL RECURSION OPERATORS AND NONLINEAR INTEGRABLE EVOLUTION EQUATIONS
M. Boiti and B. G. Konopelchenko (Inst. of Nuclear Physics, Novosibirsk, USSR) Sep. 1985 6 p refs
(PM:85-16; PACS-03.80) Avail: NTIS HC A02/MF A01

A wide class of nonlinear evolution equations is integrable by inverse scattering transform method. The use of nonformal recursion operators to solve the equation is demonstrated. B.G.

N86-21231# Montpellier Univ. (France). Lab. de Physique Mathematique.
ON A NEW HIERARCHY OF NONLINEAR EVOLUTION EQUATIONS CONTAINING THE POHLMEYER-LUND-REGGE EQUATION
F. Pempinelli and S. Potenza (Lecce Univ., Italy) Sep. 1985 26 p refs
(PM:85-17) Avail: NTIS HC A03/MF A01

A hierarchy of local nonlinear evolution equations associated with a new spectral problem is derived. Each equation is Hamiltonian and their fluxes commute. A local infinite set of conserved densities is given. An interesting reduction is considered, which a hierarchy of local nonlinear evolution equations is generated by a recursion operator and its explicit inverse. This hierarchy also satisfies a canonical geometrical scheme, containing as a special case the Pohlmeyer-Lund-Regge equation. Author

N86-21232# National Aeronautical Lab., Bangalore (India). Systems Engineering Div.
COMPUTATION OF TRANSFER FUNCTION MATRICES
J. K. Sridhar and B. Satyabhagavan Aug. 1985 30 p refs
(NAL-TM-SE-8509) Avail: NTIS HC A03/MF A01

Control systems design in frequency domain involves the computation of transfer function matrices. Details of the software developed on UNIVAC-1100/60 to compute transfer function matrices and hence zeros and poles of numerator and denominator polynomials respectively are given. The software developed here is intended to form an integral part of a package available in the

division to study longitudinal and lateral dynamics of an aircraft. Numerical algorithm and schematic flow chart is presented along with an example on a fighter aircraft model. The software is documented and validated. A user manual is provided. Author

N86-21233# National Aeronautical Lab., Bangalore (India). Aerodynamics Div.

A PRELIMINARY NOTE ON THE DEVELOPMENT OF A THREE DIMENSIONAL POTENTIAL CODE IN CARTESIAN COORDINATES

S. S. Desai, R. Rangarajan, and K. S. Ravichandran Jul. 1985 53 p refs

(NAL-TM-AE-8504) Avail: NTIS HC A04/MF A01

An existing two dimensional transonic code TRADE1 was extended in Cartesian coordinates to three dimensions. A code was developed using Cartesian coordinates, instead of the more involved body fitting coordinates, so that the incorporation of a fuselage in the code developed for wing alone case becomes straight forward. The preliminary studies show encouraging results, but also bring into focus areas in a flow field where more needs to be done for a good resolution of the flow details, particularly for swept, tapered wings. Author

N86-21234# National Aeronautical Lab., Bangalore (India). Structures Div.

FIELD-CONSISTENCY AND VIOLENT STRESS OSCILLATIONS IN FINITE ELEMENT METHOD

G. Prathap and C. Ramesh Babu Jun. 1985 43 p refs Sponsored by the Council for Scientific and Industrial Research

(NAL-TM-ST-8506) Avail: NTIS HC A03/MF A01

The fact that finite element models can give rise to violent stress oscillations has been known for some time. However, it is less well known that these oscillations arise in a specific class of problems where there are multiple strain-fields arising from one or more field-variables and where one or more of these strain-fields must be constrained in particular physical limits. In this paper, it is shown that unless the interpolations for these constrained strain-fields are field-consistent, violent oscillations would set in. The field-consistency interpretation offers a conceptual scheme to delineate these problems and an operational procedure called the functional re-constitution technique allows the errors resulting from field-inconsistency to be anticipated a priori. The power of this approach is demonstrated through an interesting example of a multi-strain field, multi-field variable problem - the inextensional deformation of a shear flexible curved beam. Author

N86-21235# National Aeronautical Lab., Bangalore (India). Structures Div.

DEVELOPMENT OF A LIBRARY OF FIELD-CONSISTENT FINITE ELEMENTS

C. Ramesh Babu, B. R. Somashekar, and G. Prathap Aug. 1985 34 p refs Sponsored by the Council for Scientific and Industrial Research

(NAL-TM-ST-8511) Avail: NTIS HC A03/MF A01

Although the finite element method has progressed rapidly from simple engineering principles to thorough and rigorous mathematical formalizations, here still exist large areas of uncertainty. Reviewed here, is some of the recent progress made in the laboratory to identify and classify a particular problem area in the finite element method, to define its new vocabulary and devise new operational procedures of error analysis based on this conceptual scheme, and to use this to design and develop and test an entire library of field-consistent elements. Author

N86-21236*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

STABILITY ANALYSIS OF SPECTRAL METHODS FOR HYPERBOLIC INITIAL-BOUNDARY VALUE SYSTEMS Final Report

David Gottlieb (Tel-Aviv Univ., Israel), Liviu Lustman, and Eitan Tadmor (Tel-Aviv Univ., Israel) Jan. 1986 39 p refs

(Contracts NAS1-17070; NAS1-18107; Grants AF-AFOSR-0089-83; NSF DMS-85-03194; DAAG29-85-K-0190) (NASA-CR-178041; ICASE-86-2; NAS 1.26:178041) Avail: NTIS HC A03/MF A01 CSCL 12A

A constant coefficient hyperbolic system in one space variable, with zero initial data is discussed. Dissipative boundary conditions are imposed at the two points x = + or - 1. This problem is discretized by a spectral approximation in space. Sufficient conditions under which the spectral numerical solution is stable are demonstrated - moreover, these conditions have to be checked only for scalar equations. The stability theorems take the form of explicit bounds for the norm of the solution in terms of the boundary data. The dependence of these bounds on N, the number of points in the domain (or equivalently the degree of the polynomials involved), is investigated for a class of standard spectral methods, including Chebyshev and Legendre collocations. Author

N86-21237# Cranfield Inst. of Tech., Bedford (England). Coll. of Aeronautics.

STABILITY THEOREMS CONCERNING HIGH ORDER EXPLICIT ALGORITHMS FOR THE LINEAR ADVECTION EQUATION

M. Lobo Oct. 1985 47 p refs

CAR-8517; ISBN-0-947767-142 Avail: NTIS HC A03/MF A01

Analysis of the stability of an N-point explicit algorithm for the linear advection equation involves the calculation of the roots of a polynominal of degree N-1. A theorem is proved to show that if the algorithm is of the nth order (n < N), then the associated stability polynomial must have a multiple root of order [n+2/2] so that, in effect, the analysis need only be carried out for a polynomial of degree N - [n + 2/2]. This technique for reducing the complexities involved in stability analysis is illustrated for families of 4- and 5- point algorithms. Moreover in the special case of ideal algorithms (for which n = N - 1), a complete stability analysis is carried through, a theorem being proved that such algorithms are always stable in their central range but never outside. Author

N86-21238# Wisconsin Univ., Madison. Mathematics Research Center.

SINGULAR SOLUTIONS FOR SOME SEMILINEAR ELLIPTIC EQUATIONS Technical Summary Report

Haim Brezis and Luc Oswald Aug. 1985 20 p

(Contract DAAG29-80-C-0041)

(AD-A160982; MRC-TSR-2858) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document gives a new proof of Veron's result concerning the classification of isolated singularities for the equation-delta u + u sub p = 0. The author also establish that the singular behavior at a point can be prescribed and determines uniquely the solution (under fixed boundary conditions). Author (GRA)

N86-21239# Wisconsin Univ., Madison.

GAUSS-NEWTON METHODS FOR THE NONLINEAR COMPLEMENTARITY PROBLEM Technical Summary Report

P. K. Subramanian Aug. 1985 26 p

(Contract DAAG29-80-C-0041; Grants NSF DCR-84-20963; NSF MCS-81-02684)

(AD-A160983; MRC-TSR-2845) Avail: NTIS HC A03/MF A01 CSCL 12/1

It is a result of Mangasarian that the nonlinear complementarity problem is equivalent to the solution of a system of nonlinear equations. This paper considers the solution of this system by the damped Gauss-Newton method using the principle of least squares minimization. Algorithms are developed which under fairly simple conditions converge locally to a solution and under stronger hypotheses converge locally quadratically. The algorithms have been used successfully to solve both linear and nonlinear complementarity problems including a standard difficult test problem due to Colville. Author (GRA)

N86-21240# Wisconsin Univ., Madison. Mathematics Research Center.

ON THE ANTI-CYLINDER Technical Summary Report

I. J. Schoenberg Jul. 1985 16 p

(Contract DAAG29-80-C-0041)
(AD-A160984; MRC-TSR-2842) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document defines a geometric figure which is called an anticylinder, like the cylinder, it has a bottom circle gamma function and a topcircle gamma function' and all common normals of gamma function and gamma function' have the same length c. Figure two exhibits a model made by the author of 1.5 feet height. Unlike the two circles of a cylinder the circles gamma function and gamma function' are linked, like two consecutive elements in a chain. If made of anodized aluminum tubing and of reasonable heignt (15 to 20 feet) it would make and attractive outdoor sculpture, of interest also to nonmathematicians, and also perhaps for children's playgrounds, the children climbing around the figure. GRA

N86-21241# Mississippi State Univ., Mississippi State. Dept. of Aerophysics and Aerospace Engineering.
NUMERICAL MODELING OF TWO-DIMENSIONAL WIDTH-AVERAGED FLOWS USING BOUNDARY-FITTED COORDINATE SYSTEMS Final Technical Report, Jun. 1979 - Sep. 1983
Joe F. Thompson and Robert S. Bernard Aug. 1985 125 p
(Contract DACW39-78-C-0054)
(AD-A160991; WES/TR/E-85-9) Avail: NTIS HC A06/MF A01 CSCL 20/4

Finite-difference solution of two-dimensional, time-dependent width-averaged Navier-Stokes equations, including an algebraic turbulence model, based on a numerically generated boundary-fitted coordinate system, is discussed. This solution, implemented by the WESSEL computer code, is applicable to 2D regions of arbitrary shape, with multiple inlets and outlets, and with obstacles in the interior. A choice of central, upwind, or ZIP differencing of the convective terms is provided. One-sided differencing is used for the continuity equation. The density is taken to be a function of the temperature, and the system of equations forming the model consists of the continuity equation, the two momentum equations, and the energy equation. Arbitrary distribution of velocity and temperature (or density) can be specified on the inlets and outlets. The solution is implicit in time, with the difference equations being solved simultaneously by SOR (successive over-relaxation) iteration at each time step. Pressure is calculated via Chorin's method. GRA

N86-21242# Wisconsin Univ., Madison. Mathematics Research Center.
ERROR BOUNDS FOR NEWTON-LIKE METHODS UNDER KANTOROVICH TYPE ASSUMPTIONS Technical Summary Report
Tetsuro Yamamoto Jul. 1985 43 p
(Contract DAAG29-80-C-0041)
(AD-A160994; MRC-TSR-2846) Avail: NTIS HC A03/MF A01 CSCL 12/1

To find sharper error bounds for iterative solutions of nonlinear equations is one of the important subjects in numerical analysis. This paper gives a method to derive new a posteriori error bounds for Newton-like methods in a Banach space under Kantorovich type assumptions. The bounds found are sharper than those of Miel and include those recently obtained by Moret. The applicability of the author's method is studied for other types of iterations. Various error bounds for the Newton method under the Kantorovich assumptions are surveyed in the Appendix. GRA

N86-21243# North Carolina Univ., Chapel Hill. Center for Stochastic Processes.
REAL INVERSION FORMULAS FOR LAPLACE AND STIELTJES TRANSFORMS Technical Report, Sep. 1984 - Aug. 1985
Jozef L. Teugels Jul. 1985 18 p
(Contract F49620-82-C-0009)
(AD-A161270; TR-111; AFOSR-85-0949TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

We provide probabilistic proofs for a number of real inversion formulas for the Laplace and for the Stieltjes transform. The main drawback of the method used in this paper is that the revelant integral transform has to be recovered from a potential inversion formula. The main virtue of the paper lies in singling out the relevance of the asymptotic behavior of the sequence d sub n for n to infinity; probabilistic arguments often provide this behavior immediately. GRA

N86-21244# Florida State Univ., Tallahassee. Dept. of Statistics.
MOMENT AND GEOMETRIC PROBABILITY INEQUALITIES ARISING FROM ARRANGEMENT INCREASING FUNCTIONS
Philip J. Boland, Frank Proschan, and Y. L. Tong Aug. 1985 13 p
(Contract F49620-85-C-0007; Grant AF-AFOSR-0113-84)
(AD-A161273; FSU-STATISTICS-M708; TR-85-182-AFOSR; AFOSR-85-0952TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

A real valued function g of two vector arguments x and y epsilon R sub n is said to be arrangement increasing if it increases in value as the arrangement of components in x becomes increasingly similar ot the arrangement of components in y. Hollander, Proschan and Sethuramen (1977) show that the composition of arrangement increasing functions is arrangement increasing. This result is used to generate some interesting probability inequalities of a geometric nature for exchangeable random vectors. Other geometric inequalities for families of arrangement increasing multivariate densities are also given and some moment inequalities are also given, and some moment inequalities are obtained. Author (GRA)

N86-21245# North Carolina Univ., Chapel Hill. Center for Stochastic Processes.
SOME GENERAL PROBABILISTIC ESTIMATIONS FOR THE RATE OF CONVERGENCE IN OPERATOR SEMIGROUP REPRESENTATIONS
Dietmar Pfeifer Sep. 1985 10 p
(Contract F49620-82-C-0009)
(AD-A161359; TR-114; AFOSR-85-0967TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Starting from well-known estimations for the rate of convergence in Hille's, Philips' and Widder's representation formulas for operator semigroups this document shows that by a suitable probabilistic approach, these results are easily reobtained, and can immediately be generalized to arbitrary (probabilistic) representation formulas. Some examples are also considered. Author (GRA)

N86-21246# North Carolina Univ., Chapel Hill. Dept. of Statistics.
INNOVATIONS AND WOLD DECOMPOSITIONS OF STABLE SEQUENCES
Stamatis Cambanis, Clyde D. Hardin, Jr., and Aleksander Weron Jul. 1985 41 p
(Contract F49620-82-C-0009)
(AD-A161437; TR-106; AFOSR-85-0946TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

For symmetric stable sequences, notions of innovation and Wold decomposition (WD) are introduced, characterized, and their ramifications in prediction theory are discussed. As the usual covariance orthogonality is inapplicable, the non-symmetric James orthogonality is used, thus leading to right and left innovations and Wold decompositions, which are related to regression prediction and least p sub th moment prediction, respectively. Independent innovations and WD are also characterized; and several examples illustrating the various decompositions are presented. Author (GRA)

N86-21247# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
TOPICS ON BOUNDARY-ELEMENT SOLUTIONS OF WAVE RADIATION-DIFFRACTION PROBLEMS
Paul D. Sclavounos and Chang-Ho Lee 1985 10 p
(Contracts N00167-84-R-0144; N00014-82-K-0198)
(AD-A161699) Avail: NTIS HC A02/MF A01 CSCL 12/1

Two topics on the numerical solution of boundary-integral equations arising in linear wave-body interactions are discussed.

The properties of a spectral technique for the solution of the integral equation are analyzed and compared to the conventional collocation method. It is shown that, using this technique, hydrodynamic forces predicted by the source-distribution method are identical to those obtained from the direct solution for the velocity potential. The second part of the paper investigates the numerical properties of a method which removes the effects of the irregular frequencies for bodies of general shape at a small computational and algorithmic overhead. Its performance is illustrated in the evaluation of the heave and sway hydrodynamic coefficients of a circle and a rectangle. Author (GRA)

N86-21248# Texas Univ., Austin. Dept. of Physics.
PERTURBATION AND CHARACTERIZATION OF NONLINEAR PROCESSES Progress Report, 15 Nov. 1984 - 14 Nov. 1985
H. L. Swinney and J. Swift 1985 7 p
(Contract DE-AS05-84ER-13147)
(DE86-001952; DOE/ER-13147/2) Avail: NTIS HC A02/MF A01

Methods of characterizing nonperiodic processes in nonlinear systems are being developed and tested on low dimensional mathematical models and applied to laboratory data for nonequilibrium systems, particularly the Belousov--Zhabotinskii (BZ) reaction. Methods developed for characterizing dynamical behavior are described first, followed by a discussion of the experimental work. DOE

N86-21249# Lawrence Livermore National Lab., Calif.
APPROXIMATE FINITE ELEMENT MODELS FOR STRUCTURAL CONTROL
K. D. Young 27 Aug. 1985 21 p Presented at the 24th IEEE Conference on Decision and Control, Fort Lauderdale, Fla., 11 Dec. 1985
(Contract W-7405-eng-48)
(DE86-001582; UCRL-93310; CONF-851209-5) Avail: NTIS HC A02/MF A01

Approximate finite element models are developed for the purpose of preserving the tridiagonality of the mass and stiffness matrices in the state space model matrices. These approximate models are utilized in the design of active structural control laws for large flexible structures. DOE

N86-21250# Instituto Nacional de Tecnica Aeroespacial, Madrid (Spain). Dept. de Informatica y Normalizacion.
CONTRIBUTIONS TO THE ANALYSIS OF NUMERICAL SERIES [ALGUNAS CONTRIBUCIONES AL ANALISIS DE SUCESIONES NUMERICAS]
Jose Manuel Garcia Conca 1985 8 p refs In SPANISH
Avail: NTIS HC A02/MF A01

The algorithms to solve by successive approximations real or complex, scalar or vectorial equations are discussed. The analysis reduces all cases to the real case and refers to the error and convergence analysis of number series. The Cauchy and D'Alambert criteria are combined to provide necessary and sufficient convergence conditions. It is shown that the error can be estimated and that integration difficulties can be detected but not always solved. Examples are presented to illustrate the method.
Author (ESA)

N86-21251# Fondazione Ugo Bordoni, Rome (Italy).
THE GENERATION OF BINARY SEQUENCES [CONSIDERAZIONI IN MERITO ALLA GENERAZIONE DI SEQUENZE BINARIE]
Giuseppe M. Poscetti Dec. 1984 35 p In ITALIAN
(FUB-27-1984) Avail: NTIS HC A03/MF A01

Definitions and properties of the generation of binary sequences including the polynomial representation of binary sequences, the generation by the division of one polynomial by another, linear feedback shift registers, and properties and examples of nonlinear feedback shift registers are discussed. Binary sequences with a fixed rate of zeros to ones are examined. Examples of the procedure to calculate the total number of different separate sequences for a given length and zeros rate are presented.
Author (ESA)

N86-21252# Fondazione Ugo Bordoni, Rome (Italy).
GENERATION OF PRIMITIVE POLYNOMIALS BY DECIMATION OF MAXIMUM LENGTH SEQUENCES [GENERAZIONE DI POLINOMI PRIMITIVI MEDIANTE DECIMAZIONE DI SEQUENZE DI MASSIMA LUNGHEZZA]
Emilio Montolivo Dec. 1984 17 p refs In ITALIAN
(FUB-29-1984) Avail: NTIS HC A02/MF A01

Decimation is defined as a procedure by which a sequence is generated from another of length l by selecting the sequence values which are at a distance k from each other. The properties of decimated sequences obtained from maximum length sequences are described. It is shown that if l and k have no common dividers the decimated sequence is also a maximum length sequence and that the primitive polynomials of r order can be sought by a decimation procedure including a Massey algorithm. Cryptography applications are pointed out. Author (ESA)

N86-20439# Joint Publications Research Service, Arlington, Va.
SOME POSSIBILITIES OF REPRESENTATION OF GRAVITATIONAL POTENTIAL BY SERIES ALWAYS CONVERGENT OUTSIDE ITS SURFACE
N. A. Chuykova *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 28 Transl. into ENGLISH from Vestnik Moskovskogo Universiteta: Fizika, Astronomiya (Moscow, USSR), v. 26, no. 5, Sep. - Oct. 1985 p 77-81 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N86-21253# Massachusetts Inst. of Tech., Cambridge.
A MODEL FOR SERIAL DEPENDENCE IN LOGISTIC REGRESSION Technical Report
Thomas Paul Lane Sep. 1985 127 p
(Contract N00014-75-C-0555)
(AD-A161274; TR-38-ONR) Avail: NTIS HC A07/MF A01 CSCL 12/1

A model is proposed for binary time series with marginal probabilities given by logistic regression on explanatory variables, by analogy with the first order autoregressive error model for least squares regression. Measurements at adjacent time points are assumed to have an odds ration that is no equal to one and that is constant as a function of time. Measurements separated in time are assumed to be conditionally independent given an intervening observation. Consequences of using and ordinary logistic model in the presence of serial dependence are explored. The closest logistic model, defined as the one with the same marginal probabilities. Consistency of the maximum likelihood estimator of the serial dependence model is proved under certain conditions, and a procedure for finding these estimates is given. Properties of the model are found, including expressions for the joint probabilities and the odds ratio between observations separated in time. The model is shown to generate a mixing processes. A score test is derived in order to test for independence after performing an ordinary logistic regression, and properties of the test are explored. The effects of missing data on the score test and on estimation of the odds ratio (with known coefficients) are presented. The model is applied to the problem of automatic classification of EKG data based on feature extraction. A positive serial dependence is found in the examples presented.
Author (GRA)

N86-21254# Florida State Univ., Tallahassee. Dept. of Statistics.
A CHARACTERIZATION OF THE GAMMA DISTRIBUTION FROM A RANDOM DIFFERENCE EQUATION
Eric S. Tollar Jul. 1985 15 p
(Contract DAAG29-82-K-0168)

(AD-A161282; FSU-STATISTICS-M705; TR-D-82-ARO; ARO-19367.29-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

A characterization of the gamma distribution is considered which arises from a random difference equation. A proof without characteristic functions is given that if V and Y are independent random variables, then the independence of V.Y and (1-V).Y results in a characterization of the gamma distribution (after excluding the trivial cases). GRA

N86-21255# Stanford Univ., Calif. Systems Optimization Lab.
ESTIMATION OF STEADY-STATE CENTRAL MOMENTS BY THE REGENERATIVE METHOD OF SIMULATION
Peter W. Glynn and Donald L. Iglehart Aug. 1985 19 p
(Contract DAAG29-84-K-0030; Grant NSF MCS-82-03483)
(AD-A161435; ARO-20927.11-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

Let X be a postive recurrent regenerative process on state space S with steady state distribution pi. Given a function f : S yields R, the problem of estimating the steady state central moments muk (supra f) = summation s (f(x)-r)(Supra k) pi(dx) is considered where r is the steady state mean of f (x(.)). Strong laws, central limit theorems, and confidence intervals for estimators, and present numerical results are obtained. Author

N86-21256# Stanford Univ., Calif. Lab. for Computational Statistics.
BAYESIAN NONPARAMETRIC BOOTSTRAP CONFIDENCE INTERVALS Technical Report
Nils L. Hjort Nov. 1985 39 p
(Contract N00014-83-K-0472)
(AD-A161786; LCS-TR-20; TR-240) Avail: NTIS HC A03/MF A01 CSCL 12/1

It is assumed that X sub 1,...,X sub n be a random sample from an unknown probability distribution P on the sample space X, and that theta = theta(P) is parameter of interest. This paper gives a Bayesian botstrap method of obtaining Bayes estimates and Bayesian confidence limits for theta, using a (nondegenerate) Dirichlet process prior for P. This extends methods and results of Rubin (1981) and Efron (1982), in that they assume the sample space to be finite and use only a particular degenerate Dirichlet prior. An asymptotic justification of the Bayesian bootstrap is given, parallelling results of Bickel and Freedman(1981). Author (GRA)

N86-21257# Department of Energy, Morgantown, W. Va. Energy Technology Center.
MECHANICAL INTERPRETATION OF STOCHASTIC PROCESSES
V. Komkov Jul. 1985 9 p
(DE85-013601; DOE/METC-85-4028) Avail: NTIS HC A02/MF A01

In this report some well-known and some not-so-well known analogies between stochastic processes and mechanisms of rigid bodies are pointed out. The discussion of these analogies is kept at an elementary level. DOE

N86-21258# Department of Energy, Morgantown, W. Va.
MONTE CARLO APPROACH TO MODELING OF CHEMICAL PROCESSES
V. Komkov Jul. 1985 78 p refs
(DE85-013609; DOE/METC-85-4029) Avail: NTIS HC A05/MF A01

While the most attractive feature of the Monte Carlo method is the ability to directly simulate diverse physical phenomena (chemical phenomena are regarded as physics), it is also a powerful technique for studying differential and integral equations. While considerable activity exists in solving integral equations arising in transport theory, not much recent literature is available on direct applications to solutions of partial differential equations, particularly to systems of nonlinear equations. For a while activity in developing the Monte Carlo method was diminished, but recently there seems to be a revival of stochastic simulation of physical phenomena, particularly in chemistry and material science. DOE

N86-21259# Brookhaven National Lab., Upton, N. Y.
COMMENTS ON THE ASSIGNMENT OF UNCERTAINTIES
N. E. Holden 1985 3 p refs Presented at the 33rd IUPAC General Assembly, Lyon, France, 30 Aug. 1985
(Contract DE-AC02-76CH-00016)
(DE86-001187; BNL-NCS-36958; CONF-8508138-4) Avail: NTIS HC A02/MF A01

Most experimentalists separate their errors into two distinct categories, random errors and systematic errors. Various statistical methods are available to provide the random error but the experimentalist is usually left with estimating bounds to systematic errors through judgement or experience. A judgement-type estimate of limits to systematic error leads one to wonder if it is merely a guess. There are those who argue that one should never estimate an upper limit to the systematic error but it should be treated as a type of statistical uncertainty. This paper discusses how one should treat this problem as far as atomic weights and isotopic composition are concerned. DOE

N86-21260# Lawrence Livermore National Lab., Calif.
APPLICATION OF PRA TO HEMP VULNERABILITY ANALYSIS
R. W. Mensing Sep. 1985 57 p
(Contract W-7405-eng-48)
(DE86-001781; UCID-20553) Avail: NTIS HC A04/MF A01

Vulnerability analyses of large systems, e.g., control and communication centers, aircraft, ships, are subject to many uncertainties. A basic source of uncertainty is the random variation inherent in the physical world. Thus, vulnerability is appropriately described by an estimate of the probability of survival (or failure). The estimate of the probability of survival is not a single value but a range of values. Probabilistic risk analysis (PRA) is a methodology which deals with these uncertainty issues. This report discusses the application of PRA to HEMP vulnerability analyses. Vulnerability analysis and PRA are briefly outlined and the need to distinguish between random variation and modeling uncertainty is discussed. Then a sequence of steps appropriate for applying PRA to vulnerability problems is outlined. Finally, methods for handling modeling uncertainty are identified and discussed. DOE

N86-21261# Los Alamos National Lab., N. Mex.
MONTE CARLO SIMULATION OF TWO-PARTICLE RELATIVE DIFFUSION USING EULERIAN STATISTICS
J. T. Lee, G. L. Stone, R. E. Lawson, Jr., and M. Shipman 1985 16 p Presented at the 7th Symposium on Turbulence and Diffusion of the AMS, Boulder, Colo., 12 Nov. 1985 Prepared in cooperation with Environmental Protection Agency, Research Triangle Park, N.C. and N.C. Northrop Services, Inc., Research Triangle Park, N.C.
(Contract W-7405-eng-36)
(DE85-015727; LA-UR-85-2745; CONF-851177-1) Avail: NTIS HC A02/MF A01

One-particle Monte Carlo simulations of relative diffusion in LSa are modified to account for interparticle velocity correlations both at the source and along the particle trajectories. The interparticle correlations are calculated directly from the Eulerian space-time velocity autocorrelation function. Since the particle trajectories are coupled, this is referred to as a two-particle model. Results from these two-particle simulations are compared to our previous one-particle results to determine the importance of the interparticle correlations downwind of the source. The models are evaluated by comparison with new wind tunnel data on the absolute diffusion and meandering of a plume in a field of grid-generated turbulence. DOE

N86-21262# Sandia National Labs., Albuquerque, N. Mex.
RANDOM VARIATION OF MODAL FREQUENCIES: EXPERIMENTS AND ANALYSIS
T. L. Paez, L. J. Branstetter, and D. L. Gregory 1985 28 p
(Contract DE-AC04-76DP-00789)
(DE86-000434; SAND-85-1379C) Avail: NTIS HC A03/MF A01

The purpose of this investigation is to establish an analytic technique for the estimation of the second order statistical moments

(mean, variance, covariance) of modal frequencies when one or more underlying structural parameters are random variables is established. The analytical investigation summarized here shows that the moments of modal frequencies can be defined in terms of some simpler measure of structural characteristics. The second order moments of a structural system can be evaluated approximately. Some examples are presented. The first example shows the results of a sequence of experiments in which the fundamental frequency of a cantilever beam is evaluated repeatedly. The fundamental frequency varies randomly, and its mean and variance are estimated from measured data. In the same example, the mean and variance of an underlying random variable (base stiffness of the cantilever beam) are estimated from data, and it is shown that these moments can be used in the analytic framework developed here to estimate the mean and variance of the fundamental frequency. Good agreement exists between the experimental and analytical results. DOE

N86-21263# Oak Ridge National Lab., Tenn.
NLO ERROR PROPAGATION EXERCISE: STATISTICAL RESULTS
D. J. Pack and D. J. Downing Sep. 1985 111 p
(Contract DE-AC05-84OR-21400)
(DE86-001228; ORNL/CSD-128) Avail: NTIS HC A01

The NLO error propagation exercise was planned as a field demonstration of the utilization of statistical error propagation methodology at the Feed Materials Production Center in Fernald, Ohio from April 1 to July 1, 1983 in a single material balance area formed specially for the exercise. Major elements of the error propagation methodology were: variance approximation by Taylor Series expansion; variance cumulation by uncorrelated primary error sources as suggested by Jaech; random effects ANOVA model estimation of variance effects (systematic error); provision for inclusion of process variance in addition to measurement variance; and exclusion of static material. The error propagation Limits of Error on Inventory Differences (LEIDs) did encompass the actual uranium and (235)U inventory differences. Further, one can see that error propagation actually provides guidance for reducing inventory differences and LEIDs in future time periods. DOE

N86-21264# Tilburg Univ. (Netherlands). Dept. of Economics.
TESTING THE MEAN OF AN ASYMMETRIC POPULATION: JOHNSON'S MODIFIED t TEST REVISED
J. P. C. Kleijnen, G. L. J. Kloppenburg, and F. L. Meeuwsen Aug. 1985 25 p refs
(FEW-183) Avail: NTIS HC A02/MF A01

Johnson's (1978) modification of Student's t test was assessed. Confidence intervals based on the quadratic approximation were investigated geometrically. Monte Carlo experiments yield estimates of the coverage and power of several variations of Johnson's test. The experiments show that the quadratic approximation is superior. Author (ESA)

N86-21265# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Automatic Control.
COMPUTER-AIDED GRAY-BOX IDENTIFICATION
Torsten Bohlin 1985 21 p refs Presented at 7th International Symposium on Mathematical Theory of Networks and Systems, Stockholm, Sweden, Jun. 1985
(TRITA-REG-8502) Avail: NTIS HC A02/MF A01

Contaminated data and partial knowledge of an object structure is studied, applying statistical inference and validation methods to generate a number of algorithms and procedures. A way to develop interactive programs for computer aided modeling of such cases is presented. The steps of a typical identification session are listed as a sequence of fitting and validation steps, designed to arrive at the simplest model that does not contradict data. It is shown that identification algorithms for two rather general classes of case elements for which exact predictors are known are feasible. In addition, use of approximate predictors allows solution of still wider classes of identification problems. Author (ESA)

N86-21266# Fondazione Ugo Bordoni, Rome (Italy).
CORRELATION AND COVARIANCE METHODS FOR VECTOR SIGNALS APPLIED TO AUTOREGRESSIVE NONSTEADY ANALYSES [I METODI DI CORRELAZIONE E DI COVARIANZA PER SEGNALI VETTORIALI APPLICATI NELLANALISI AUTOREGRESSIVA NON-STAZIONARIA]
Lucio Prina Ricotti Dec. 1984 76 p refs In ITALIAN
(FUB-23-1984) Avail: NTIS HC A05/MF A01

Coefficient estimation methods to extend linear regression to the nonsteady case are discussed. A typical application is the analysis of voice signals. The main characteristic of the procedure is that the linear prediction filter is adaptive. The model includes parameters which vary in a continuous way. Even if the number of coefficients to estimate is larger, the unsteady model requires a smaller number of segment samples, resulting in a smaller number of system parameters. Details of the computer program are presented. Author (ESA)

N86-21267# Tilburg Univ. (Netherlands). Dept. of Economics.
ESTIMATION IN A LINEAR MODEL WITH SERIALLY CORRELATED ERRORS WHEN OBSERVATIONS ARE MISSING
Tom Wansbeek and Arie Kapteyn 16 Jan. 1984 37 p refs
(FEW-139; BPA-13640-82-M1) Avail: NTIS HC A03/MF A01

The estimation of the linear regression model with AR(1) errors on the basis of time series data obtained at irregular intervals or with missing observations is discussed. The structure of the error covariance matrix is analyzed, and a simpliying transformation of the model which allows for least squares estimation is derived. The maximum likelihood estimate (MLE) of the parameters is given and its asymptotic covariance matrix is established. The performance of ML vis-a-vis two-stage estimation methods is assessed using real and simulated data. Although MLE is the most complicated, it is the most efficient. A simpler (two step) estimator with almost identical performance is presented. Author (ESA)

N86-21268# Tilburg Univ. (Netherlands). Dept. of Economics.
IDENTIFICATION OF LINEAR STOCHASTIC MODELS WITH COVARIANCE RESTRICTIONS
Paul A. Bekker and D. S. G. Pollock 1985 38 p refs Sponsored by Netherlands Organization for the Advancement of Pure Research
(FEW-144) Avail: NTIS HC A03/MF A01

Identification in systems of linear structural equations where disturbances are uncorrelated is treated. The class of decomposable covariance restrictions that give rise to relationships of exogeneity is defined. The wider class of recursively decomposable restrictions is introduced. If all the covariance restrictions are recursively decomposable, then any set of structural parameters that are identifiable are also globally or uniquely identifiable. Undecomposable covariance restrictions are considered. Such restrictions no longer afford an assurance of global identification. Nevertheless, for one model a simple criterion for discriminating amongst the isolated solutions of the identifying equations is shown. Author (ESA)

N86-21269# Tilburg Univ. (Netherlands). Dept. of Economics.
STATISTICALLY AND COMPUTATIONALLY EFFICIENT ESTIMATION OF THE GRAVITY MODEL
Tom Wansbeek (Groningen Rijksuniv., Netherlands) and Arie Kapteyn 1985 18 p refs
(FEW-154) Avail: NTIS HC A02/MF A01

Least squares estimation of the gravity model in log-linear form is discussed. Computational efficiency (essential when the number of nodes distinguished is large) obtained by the covariance transformation can only be applied when flows are observed between all nodes. It therefore breaks down in the generic case where there are no flows observed from node i to itself. A transformation that allows for efficient computation of the estimates in the generic case is presented. Author (ESA)

N86-21270# Tilburg Univ. (Netherlands). Dept. of Economics.
AN IMPLEMENTATION OF AN INVENTORY MODEL WITH STOCHASTIC LEAD TIME

R. Heuts and J. vanLieshout 1985 20 p refs
(FEW-158) Avail: NTIS HC A02/MF A01

An inventory model having as lead time demand distribution a Schmeiser-Deutsch distribution is analyzed. It is shown that this type of distribution is very suitable as it can have many different shapes. A method for estimating the parameters of this distribution is developed and the explicit cost function of the model as function of the order quantity and the reorder level is derived. Properties of this function are given together with a global algorithm to find the optimal order quantity and reorder point. Author (ESA)

N86-21159# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
ORDER STATISTICS, QUANTILE PROCESSES AND EXTREME VALUE THEORY
R. Helmers *In its* CWI Newsletter Sep. 1984 p 33-38 refs Presented at Meetingheld in Oberwolfach, West Germany, 25-31 Mar. 1984 (For primary document see N86-21156 11-60)
Avail: NTIS HC A04/MF A01

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N86-21271# National Aeronautical Lab., Bangalore (India). Systems Engineering Div.
ROBUST EIGENSYSTEM ASSIGNMENT IN MULTI-INPUT SYSTEMS
S. Srinathkumar and R. V. Jategaonkar May 1985 14 p refs
(NAL-TM-SE-8506) Avail: NTIS HC A02/MF A01

Using simple geometric concepts it is shown that system sensitivity to parameter perturbation stems from the numerical illconditioning of the normalized modal matrix (matrix of eigenvectors) to inversion, which is quantified by the absolute value of its determinant. By noting the freedom in partial election of eigenvectors, beyond eigenvalue assignment in multi-input state feedback systems, an optimization procedure is formulated to maximize the modal matrix determinant and thus minimize eigensystem sensitivity. Author

N86-21272# Illinois Univ., Urbana. Urbana Decision and Control Lab.
CONTROLLER DESIGN FOR LINEAR STOCHASTIC SYSTEMS WITH UNCERTAIN PARAMETERS M.S. Thesis
Paul Howard McDowell Mar. 1985 170 p
(AD-A161428; DC-77; IU-UILU-ENG-85-2213; R-1038) Avail: NTIS HC A08/MF A01 CSCL 12/1

The design of optimal controllers for linear stochastic systems requires an accurate description of the system. However, the construction of an accurate model of real systems is often not possible. These inaccuracies can stem from the fact that the adopted linear model may be only a first-order approximation of a nonlinear system. Also, there may be actual uncertainty in the parameters of the real system. This type of uncertainty can arise, for instance, if one wishes to design a single type of controller for a large number of similar systems, when, for example, the system is mass produced and it is impractical to tune each controller to each system. Another situation where this type of uncertainty can arise is when the parameters of a single system varies slowly over long periods of time, perhaps due to wear or changes in the environment. These uncertainties, in this thesis, are grouped into a vector of parameter. Several ways of handling these uncertainties in the design process are considered. GRA

N86-21273# Northwestern Univ., Evanston, Ill.
MARKOV PROCESSES APPLIED TO CONTROL, REPLACEMENT AND SIGNAL ANALYSIS Annual Report, 1 Jun. 1984 - 31 May 1985
Erhan Cinlar Oct. 1985 7 p
(Grant AF-AFOSR-0189-82)
(AD-A162431; AFOSR-85-1085TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The concept of intrinsic age was introduced to relate the deterioration of a component under field conditions to the deterioration it would have experienced under laboratory conditions. Work has begun on research into random shapes. Additional research was performed on the stability of a harmonic oscillator in the presence of small noise. GRA

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

No abstracts in this category.

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics.* For astrophysics see *90 Astrophysics.* For solar physics see *92 Solar physics.*

N86-21274# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil). Space Mechanics and Control Dept.
EXACTLY SOLVING THE WEIGHTED TIME-FUEL OPTIMAL CONTROL OF AN UNDAMPED HARMONIC OSCILLATOR
Marcelo LopesdeOliveiraeSouza Jan. 1986 31 p refs Submitted for publication
(INPE-3750-PRE/874) Avail: NTIS HC A03/MF A01

The exact solution to weighted time/fuel optimal control of an undamped harmonic oscillator is presented. Its motivation is the possibility of improvements on the final behavior of trajectories produced by Vander Velde's design for on/off controls of large space structures, by replacing the approximate solution by the exact one. First order necessary conditions. The existence, normality, unicity, and determination of its externals and its solution were investigated. Numerical comparisons between those solutions were made according to three criteria. Author

N86-21275# Argonne National Lab., Ill.
MAGNETIC RELAXATION IN HIGHLY ANISOTROPIC SYSTEMS
A. J. Fedro and B. D. Dunlap 1985 10 p refs Presented at the International Conference on Magnetism, San Francisco, Calif., 26 Aug. 1985 Prepared in cooperation with Univ. of Northern Illinois, Dekalb
(Contract W-31-109-eng-38)
(DE85-014992; CONF-850890-8) Avail: NTIS HC A02/MF A01

Using the Mori formalism, a general theory is developed for the calculation of paramagnetic relaxation effects in a general crystal field doublet. For systems with extreme magnetic anisotropy, the relaxation rates show a strong angular dependence, being severely peaked in a direction perpendicular to the magnetic easy axis. Application to the RRh4B4 (R = rare-earth) compounds is discussed. DOE

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution.*

N86-21276* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ULTRASONIC ANGLE BEAM STANDARD REFLECTOR Patent
Robert F. Berry, Jr., inventor (to NASA) Issued 17 Dec. 1985 5 p Filed 19 Mar. 1984
(NASA-Case-LAR-13153-1; US-Patent-4,558,585;
US-Patent-Appl-SN-590921; US-Patent-Class-73-1-DV;
US-Patent-Class-72-341; US-Patent-Class-72-324) Avail: US

Patent and Trademark Office CSCL 20A

A method that provides an impression profile in a reference standard material utilized in inspecting critically stressed components with pulsed ultrasound is described. A die stamp having an I letter is used to impress the surface of a reference material. The die stamp is placed against the surface and struck with an inertia imparting member to impress the I in the reference standard material. Upset may appear on the surface as a result of the impression and is removed to form a smooth surface. The stamping and upset removal is repeated until the entire surface area of a depth control platform on the die stamp uniformly contacts the material surface. The I impression profile in the reference standard material is utilized for reflecting pulsed ultrasonic beams for inspection purposes.

Official Gazette of the U.S. Patent and Trademark Office

N86-21277 California Inst. of Tech., Pasadena.
EDGETONES AND ACOUSTIC RESONANCES IN A DUCT Ph.D. Thesis
Kim Maynard Aaron 1985 131 p
Avail: Univ. Microfilms Order No. DA8519532

Undesirable sound generation in the combustion chamber of segmented solid propellant rocket motors has been attributed to vortex shedding from obstructions that are uncovered as the propellant burns back. This phenomenon was investigated experimentally and the mechanism are explained. Flow visualization using smoke and a strobe light triggered by the pressure oscillations indicate that vortex shedding occurs at the first baffle in phase with the acoustic velocity oscillations there. The interaction of these vortices with the downstream baffle drives the acoustic resonance which, in turn, triggers the formation of new vortices at the upstream separation point. The phase relations for the feedback to operate require that there be close to an integral number of wavelengths, or vortices, from the separation point to the impingement point. A model was developed which predicts the experimentally observed behavior. Pressure amplitudes are predicted within an order of magnitude. Mean flow rates and baffle spacings yielding maximum response are determined correctly by the model. Dissert. Abstr.

N86-21278 Washington Univ., St. Louis, Mo.
ULTRASONIC BACKSCATTER: A QUANTITATIVE INDEX OF THE ELASTIC PROPERTIES OF INHERENTLY INHOMOGENEOUS MEDIA Ph.D. Thesis
Lewis J. Thomas, III 1985 169 p
Avail: Univ. Microfilms Order No. DA85120815

The use of backscattered ultrasound to determine physical parameters of inhomogeneous materials was investigated. Experimental methods were described for determining backscatter efficiency (integrated backscatter), a quantity which is closely related to the backscatter coefficient. These methods were used to study fatigue and impact damage in graphite-epoxy composite laminates and living hearts. A technique was described for determining the slope of attenuation with frequency from backscattered ultrasound. This technique is based on the Wigner distribution of the backscattered signal. The application of these techniques permitted determination of the physical parameters of a specimen, thereby allowing a quantitative assessment of the condition of the specimen. By using the polar backscatter technique we were able to investigate the effects of both impact and fatigue on specific lamina of graphite-epoxy composite laminates. Dissert. Abstr.

N86-21279# Federal Aviation Administration, Washington, D.C.
NOISE LEVELS FOR US CERTIFICATED AND FOREIGN AIRCRAFT
4 Nov. 1985 101 p
(FAA-AC-36-1D) Avail: NTIS HC A06/MF A01

U.S. Department of Transportation Advisory Circular No. 36-1D (11/4/85) provides noise level data for airplanes certificated under FAR Part 36. Noise level data for foreign airplanes certificated to ICAO Annex 16 standards are also provided in a separate appendix for informational purposes. New appendices have been added to represent selected configurations of U.S. certificated aircraft and to provide listings of noise levels ranked in descending order.

Author

N86-21280*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NEW TECHNIQUES FOR EXPERIMENTAL GENERATION OF TWO-DIMENSIONAL BLADE-VORTEX INTERACTION AT LOW REYNOLDS NUMBERS
Earl Booth, Jr. and James C. Yu Mar. 1986 27 p refs
(NASA-TP-2551; L-15981; NAS 1.60:2551) Avail: NTIS HC A03/MF A01 CSCL 20A

An experimental investigation of two dimensional blade vortex interaction was held at NASA Langley Research Center. The first phase was a flow visualization study to document the approach process of a two dimensional vortex as it encountered a loaded blade model. To accomplish the flow visualization study, a method for generating two dimensional vortex filaments was required. The numerical study used to define a new vortex generation process and the use of this process in the flow visualization study were documented. Additionally, photographic techniques and data analysis methods used in the flow visualization study are examined. Author

N86-21281*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INFRASONIC EMISSIONS FROM LOCAL METEOROLOGICAL EVENTS: A SUMMARY OF DATA TAKEN THROUGHOUT 1984
Allan J. Zuckerwar, J. W. Stroughton, and C. W. Khalaf Feb. 1986 50 p refs Prepared in cooperation with Old Dominion Univ., Norfolk, Va.
(Contract NAS1-17099)
(NASA-TM-87686; NAS 1.15:87686) Avail: NTIS HC A03/MF A01 CSCL 20A

Records of infrasonic signals, propagating through the Earth's atmosphere in the frequency band 2 to 16 Hz, were gathered on a three microphone array at Langley Research Center throughout the year 1984. Digital processing of these records fulfilled three functions: time delay estimation, based on an adaptive filter; source location, determined from the time delay estimates; and source identification, based on spectral analysis. Meteorological support was provided by significant meteorological advisories, lightning locator plots, and daily reports from the Air Weather Service. The infrasonic data are organized into four characteristic signatures, one of which is believed to contain emissions from local meteorological sources. This class of signature prevailed only on those days when major global meteorological events appeared in or near to eastern United States. Eleven case histories are examined. Practical application of the infrasonic array in a low level wing shear alert system is discussed. Author

N86-21282# Tennessee Univ., Knoxville. Dept. of Physics.
NONLINEAR ACOUSTICS Annual Summary Report, 1 Dec. 1984 - 30 Nov. 1985
M. A. Breazeale 3 Oct. 1985 6 p
(Contract N00014-81-K-0229; DA Proj. RR0-1108)
(AD-A160366) Avail: NTIS HC A02/MF A01 CSCL 20/1

Nonlinear properties of solids and liquids are studied. Both pulsed and CW ultrasonic waves are used in the ultrasonic measurements which are made by electronic as well as optical techniques. Nonlinear properties of solids of cubic, hexagonal, and trigonal symmetries are described in terms third-order elastic constants which can be measured between room temperature and 4K; those of liquids are described in terms of ratio B/A of coefficients in the equation of state. Nonlinear diffraction theory is considered. GRA

N86-21283# Computer Sciences Corp., San Diego, Calif.
BEAMFORMING TECHNIQUES TO SEPARATE THE SOUND PATHS BY VERTICAL ARRIVAL ANGLE IN SHALLOW WATER Final Report
P. W. Schey Sep. 1985 57 p
(Contract N66001-83-D-0043)
(AD-A161546; NOSC-CR-304) Avail: NTIS HC A04/MF A01

CSCL 17/1

The purposes of this project were: (1) to test the ability of various beamforming techniques to separate the sound paths by vertical arrival angle in a shallow water environment; (2) to determine if a source can be localized in range and depth by back raytracing; and (3) to test matched field detection as a method of determining source range and depth. GRA

N86-21284# Yale Univ., New Haven, Conn. Dept. of Mechanical Engineering.

PROPERTIES OF MATERIALS USING ACOUSTIC WAVES Annual Report, 1 Nov. 1984 - 31 Oct. 1985

R. E. Apfel Oct. 1985 29 p

(Contract N00014-85-K-0215; RR0-1108)

(AD-A161629) Avail: NTIS HC A03/MF A01 CSCL 20/1

Our goal of characterizing materials using acoustic waves was forwarded through a number of projects: (1) We have derived a theory, and tested it on tissues, for predicting the composition of composite materials using mixture rules, such as the one we derived for the nonlinear parameter two years ago; (2) We have published one article and another is in review on our use of modulated acoustic radiation pressure on levitated drops to characterize interfaces with and without surfactants. We have begun to study in a systematic way the nonlinear dynamics of drops, including drop fission: (3) we have improved apparatus for 30 MHz ultrasonic scattering from microparticles (approx. micron size), which should allow us to discriminate between different microparticles in a liquid; (4) We have begun to study the nonlinear mechanics of hydrodynamic solitons in cylindrical (2-d) geometry; and (5) We have been studying the use of acoustic levitation for transducer calibration. GRA

N86-21285# Lawrence Livermore National Lab., Calif.

ACOUSTIC MICROSCOPY OF ROUGH SURFACES

B. P. Bonner, S. E. Benson, and J. G. Berryman 26 Jul. 1985 17 p Presented at the Multiple Scattering of Waves in Random Media and Random Rough Surfaces, University Park, Pa., 29 Jul. 1985

(Contract W-7405-eng-48)

(DE86-001723; UCRL-92422; CONF-850787-2) Avail: NTIS HC A02/MF A01

Water-saturated lightly sintered packs of nearly spherical glass particles with radii (a) ranging from approx. 30 to approx. 110 microns were examined over a wide frequency range (21 to 90 MHz) with the focused reflecting acoustic microscope (FRAM). Back scattered images can be compared for a wide range of 2(PI)a/lambda, from approx. 5 to 30, where lambda is the wavelength of the incident wave. The images are digital, and are analyzed with image processing techniques. Assuming that the imaged surface is representative of the bulk porosity, two- and three-point spatial correlation functions can be computed from the FRAM data. These measurements are then compared qualitatively to exact calculation results for arrays of impenetrable spheres. DOE

N86-21286# Technische Hogeschool, Delft (Netherlands). Lab. voor Technische Natuurkunde.

PITCH DISCRIMINATION FOR VARIOUS MODEL STIMULI [HET TOONHOOGTEONDERSCHEIDINGSVERMOGEN VOOR DIVERSE STIMULI GEMODELLEERD]

F. W. Wittkaemper Aug. 1983 166 p refs In DUTCH; ENGLISH summary

Avail: NTIS HC A08/MF A01

An extension of the model for the critical band scale (Zwicker, 1967), based on the steepness of the slopes in the excitation pattern of a stimulus on the frequency scale, was developed. This Just Noticible Discrimination (JND) model for the frequency scale is more general than the model for the critical band scale, as the choice of the filters is not determined. Based on a series of auditory filters, the model was tested comparing measured and calculated JND values for the stimuli: sinusoid, periodic impulse, cosine noise, and comb filter noise. It appears that the model reproduces the JND in pitch reasonably to well. Author (ESA)

N86-21287# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost.

RECENT EXPERIENCES IN THE ANALYSIS OF AIRCRAFT CABIN NOISE

Rudolf F. C. Kriens 1985 5 p refs Presented at Inter-Noise 85, Munich, West Germany, 18-20 Sep. 1985

Avail: NTIS HC A02/MF A01

Reduction of cabin noise in propeller driven aircraft is discussed. Separation of cabin noise into left and right hand components is described. Acoustic finite element analysis and airborne acoustic intensity measurements are reviewed.

Author (ESA)

N86-20901# Joint Publications Research Service, Arlington, Va.

FLUCTUATIONS IN PROPAGATION TIME AND DIRECTION OF ARRIVAL OF SIGNAL REFLECTED FROM WAVE-COVERED SEA SURFACE Abstract Only

V. M. Frolov *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 22-23 Transl. into ENGLISH from Izvestiya Nauk SSSR: Fizika Atmosfery I Okeana (Moscow, USSR), v. 21, no. 7, Jul. 1985 p 768-774 (For primary document see N86-20887 11-42)

Avail: NTIS HC A04

N86-20908# Joint Publications Research Service, Arlington, Va.

ACOUSTIC FIELD IN UNDERWATER WAVEGUIDE WITH RANDOM INHOMOGENEITIES Abstract Only

A. G. Nechayev *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 27-28 Transl. into ENGLISH from Akusticheskiy Zhurnal (Moscow, USSR), v. 31, no. 3, May - Jun. 1985 p 358-364 (For primary document see N86-20887 11-42)

Avail: NTIS HC A04

N86-20909# Joint Publications Research Service, Arlington, Va.

DETERMINING UNIVERSAL HIGH-FREQUENCY ASYMPTOTIC SPECTRAL FORMS ASSOCIATED WITH PROPAGATION OF INTENSIVE ACOUSTIC NOISE Abstract Only

L. Bjorno and S. N. Gurbatov *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 28 Transl. into ENGLISH from Akusticheskiy Zhurnal (Moscow, USSR), v. 31, no. 3, May - Jun. 1985 p 303-308 (For primary document see N86-20887 11-42)

Avail: NTIS HC A04

N86-20910# Joint Publications Research Service, Arlington, Va.

DIFFERENTLY DIRECTED MOVEMENTS OF GAS BUBBLES IN VIBRATING FLUIDS IN PRESENCE OF PHYSICAL INHOMOGENEITIES Abstract Only

N. A. Pelykh *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 28 - 29 Transl. into ENGLISH from Prikladnaya Mekhanika (Kiev, USSR), v. 21, no. 6, Jun. 1985 p 100-107 (For primary document see N86-20887 11-42)

Avail: NTIS HC A04

N86-20921# Joint Publications Research Service, Arlington, Va.

CALCULATION OF SOUND FIELDS IN ATMOSPHERIC REFRACTION WAVEGUIDE Abstract Only

A. V. Razin *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 45-46 Transl. into ENGLISH from Izvestiya Akademii Nauk SSSR: Fizika Atmosfery I Okeana (Moscow, USSR), v. 21, no. 7, Jul. 1985 p 707-713 Previously announced in IAA as A85-46238 (For primary document see N86-20887 11-42)

Avail: NTIS HC A04

N86-20922# Joint Publications Research Service, Arlington, Va.

ACOUSTIC WAVE PROPAGATION IN POLYMERIC FLUID WITH VAPOR-GAS BUBBLES Abstract Only

S. P. Levitskiy and Z. P. Shulman *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 46 Transl. into ENGLISH from Akusticheskiy Zhurnal (Moscow, USSR), v. 31, no. 3, May - Jun. 1985 p 353-357 (For primary document see N86-20887 11-42)

Avail: NTIS HC A04

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N86-21288# Montpellier Univ. (France). Lab. de Physique Mathematique.
INTRODUCTION TO ILL-POSED ASPECTS OF NUCLEAR SCATTERING
Pierre C. Sabatier Jun. 1985 20 p refs
(PM/85-12; CNRS-040768; RCP-264) Avail: NTIS HC A02/MF A01

This survey is presented as an educational tool. It tries to present in a simple way the main ill-posed aspects of inverse problems arising in nuclear scattering. Some examples are given which explains how they are dealt with or how they are circumvented. Author

N86-21289# Naval Research Lab., Washington, D. C.
MOLECULAR ORBITAL STUDY OF ACYCLICAL NITRAMINE COMPOUNDS Interim Report
G. H. Herling 25 Sep. 1985 34 p
(RR0-1201)
(AD-A159351; AD-E700020; NRL-MR-5641) Avail: NTIS HC A03/MF A01 CSCL 20/8

The results of MNDO and MINDO/3 semiempirical self-consistent field calculations for the ground state structures, hears of formation, and dipole moments of several acyclical nitramine compounds are compared with each other and experiment. Because the reactions of such molecules are complicated, it may happen that the first steps of their decompositions are not amenable to experimental study, and, in order to attempt to obtain an understanding of the complete dynamics, it is necessary to perform theoretical calculations. The small value of the ratio of electron to proton masses, 1/1823, leads to a decoupling of the electronic motion from that of the heavy particles, the Born-Oppenheimer approximation. The quantum mechanical treatment of the electronic motion for fixed positions of the nuclei forms the basis of quantum chemistry which generates a potential energy surface that determines the heavy particle motion classically, semiclassically, or quantum mechanically. In Sec 2, the Hartree-Fock (HF) self-consistent field (SCF) method is briefly described. The reduction of the HF equations by means of atomic orbitals (AO's) is described as is the problem of multifold proliferation of matrix elements. In Sec 3, the reduction of the full SCF Hamiltonian to the MINDO/3 and MNDO forms is discussed, and the empirical parameterization of matrix elements is described. In Sec. 4, the results obtained for the ground state properties of several acyclical nitramine compounds using MINDO/3 and MNDO Hamiltonians are compared with each other and with experiment. GRA

N86-21290# Rome Air Development Center, Griffiss AFB, N.Y.
MULTIPLE SCATTER CROSS SECTIONS FOR ANISOTROPIC KOLMOGOROFF TURBULENCE Report, Sep. 1982 - Dec. 1983
S. P. Yukon Feb. 1985 40 p
(AD-A160357; RADC-TR-85-22) Avail: NTIS HC A03/MF A01 CSCL 20/14

The cross section for multiple scattering from anisotropic random media are calculated for scattering into forward and backward directions from slabs containing electron density or refractive index irregularities whose symmetry axes are aligned at an arbitrary angle to the slab face. The cross sections are calculated in the CFSB (Simulative Forward-scatter Single-backscatter) approximation using techniques used in RADC-TR-82-287 (AD-A127873) and extended here to include arbitrary turbulence spectra and, in particular, three-dimensional Kolmogoroff turbulence. GRA

N86-21291# North Carolina State Univ., Raleigh. Dept. of Physics.
DEVELOPMENT OF AN X-RAY BEAM LINE AT THE NSLS FOR STUDIES IN MATERIALS SCIENCE USING X-RAY ABSORPTION SPECTROSCOPY Progress Report
D. E. Sayers 1 Oct. 1985 24 p
(Contract DE-AS05-80ER-10742)
(DE86-001954; DOE/ER-10742/4) Avail: NTIS HC A02/MF A01

This has been an exciting year, highlighted by the running of the NSLS X-ray ring in an operational mode beginning in May of this year. Line X-11A was the first to obtain an experimental spectrum and the first to publish a paper with results from the X-ray ring. These early successes have allowed running in an operational mode during the entire time that the X-raying ring itself was operational. In addition to a number of exciting initial scientific results described, the initial results, particularly in the four crystal mode, have verified the original optical design and demonstrated an improved resolution using the four crystals. This will have a significant impact on near edge (XANES) studies. DOE

N86-21292# Lawrence Livermore National Lab., Calif.
CROSS SECTIONS FOR X-RAY PHOTOELECTRON-INDUCED DESORPTION OF HYDROGEN IONS FROM METAL SURFACES
J. H. Kinney, W. J. Siekhaus, and R. A. Anderson 20 Sep. 1985 17 p refs
(Contract W-7405-eng-48)
(DE86-001777; UCID-20520) Avail: NTIS HC A02/MF A01

We have measured the cross sections for X-ray photoelectron-induced desorption of hydrogen ions from beryllium, carbon, aluminum, tantalum, and gold surfaces. This report describes the results of the cross-section measurements, and discusses a time-of-flight technique that allows the determination of ionic-desorption cross sections as small as 10(-25) sq cm per photoelectron. DOE

N86-21293# Argonne National Lab., Ill.
CROSS SECTIONS FOR INELASTIC COLLISIONS OF FAST CHARGED PARTICLES WITH ATOMS AND MOLECULES
Mitio Inokuti 1985 9 p refs Presented at the IAEA Advisory Group Meeting on Nuclear and Atomic Data for Radiotherapy and Radiobiology, Rijswijk, Netherlands, 16 Sep. 1985
(Contract W-31-109-eng-38)
(DE86-001802; CONF-8509178-2) Avail: NTIS HC A02/MF A01

A large volume of data of these cross sections are required for solving problems of radiological physics and dosimetry, as well as for detailed analysis of the earliest stage of radiation actions on matter (including the biological cell and substances constituting it). One practical approach to the cross section determination is to test experimental data with general criteria. More recent studies concern the determination of the analytic expression most suitable for fitting the data on the oscillator-strength distribution or the energy distribution of secondary electrons from ionizing collisions of charged particles. There are three areas to which major efforts should be directed. First, methods of absolute cross-section measurements both for electron and ionic collisions must be thoroughly reviewed so that sources of systematic errors may be identified and corrected. Second, efforts should be devoted to the understanding of the data systematics, viz., the trends of cross sections for a series of molecules. Finally, electron and ionic collisions with molecules in condensed phases will be an important topic of study for years to come. DOE

N86-21294# Technische Hogeschool, Delft (Netherlands). Lab. voor Technische Natuurkunde.
INVESTIGATION OF A DRIFT CHAMBER [ONERZOEK AAN EEN DRIFTKAMER]
D. Langerveld and R. W. Hollander Jun. 1983 31 p refs In DUTCH
(Stratech-83-3) Avail: NTIS HC A03/MF A01

Two double drift chambers, built to locate ionizing radiation in one coordinate direction at an accuracy of 1 mm were investigated. For low pressure purposes the investigation was extended with the determination of the spatial resolution at 200 Torr.

Disturbances in the time signal, and effects which determine the width of the time spectrum peak were examined. Attention was paid to the energy spectrum of primary electrons at 1 atm and the information yielded. The linear relation between time and position appears to fit accurately. An expression for the electron transport efficiency as a function of the distance to the side-walls is presented. Author (ESA)

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N86-21295 Japan Atomic Energy Research Inst., Tokai. Dept. of Physics.
EVALUATION OF NEUTRON NUCLEAR DATA OF LI(7) FOR JENDL-3
Keiichi Shibata Nov. 1984 50 p refs
(JAERI-M-84-204; NEANDC(J)-109/U; INDC(JPN)-95/L) Copyright. Avail: Issuing Activity

Neutron nuclear data of Li-7 were evaluated for Japanese Evaluated Nuclear Data Library (JENDL-3) in the energy range from 10 to the -minus 5th power eV to 20 MeV. Evaluated quantities are the total, elastic and inelastic scattering, radiative capture, photon production, (n,Zn), (n,d) and (n,n') alpha tau reaction cross sections and the angular and energy distributions of secondary neutrons. For the inelastic scattering two discrete levels were taken into consideration. The energy angle distributions of neutrons from the inelastic scattering to continum and the (n,Zn) reaction were calculated with the three body phase space model. Author

N86-21296# Los Alamos National Lab., N. Mex.
DOCUMENTATION FOR TRACE: AN INTERACTIVE BEAM-TRANSPORT CODE
K. R. Crandall and D. P. Rusthoi Jan. 1985 68 p refs
(LA-10235-MS) Avail: NTIS HC A04/MF A01

TRACE is an interactive, first order, beam dynamics computer program. TRACE includes space charge forces and mathematical models for a number of beamline elements not commonly found in beam transport codes, such as permanent magnet quadrupoles, RF quadrupoles, RF gaps, accelerator columns, and accelerator tanks. TRACE provides an immediate graphic display of calculative results, has a powerful and easy-to-use command procedure, includes eight different types of beam matching or fitting capabilities, and contains its own internal HELP package. The models and equations used for each of the transport elements, the fitting procedures, and the space charge/emittance calculations are described, and detailed instruction for using the code is provided. Author

N86-21297*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SECOND QUANTIZATION TECHNIQUES IN THE SCATTERING OF NONIDENTICAL COMPOSITE BODIES
John W. Norbury (Old Dominion Univ., Norfolk, Va.), Lawrence W. Townsend, and Philip A. Deutchman (Idaho Univ., Moscow) Jan. 1986 18 p refs
(NASA-TP-2522; L-16016; NAS 1.60:2522) Avail: NTIS HC A02/MF A01 CSCL 30H

Second quantization techniques for describing elastic and inelastic interactions between nonidentical composite bodies are presented and are applied to nucleus-nucleus collisions involving ground-state and one-particle-one-hole excitations. Evaluations of the resultant collision matrix elements are made through use of Wick's theorem. Author

N86-21298# Committee on Science and Technology (U. S. House).
SPACE NUCLEAR POWER GENERATION, CONVERSION AND STORAGE FOR THE NINETIES AND BEYOND
Washington GPO 1986 19 p Presented by the Subcommittee on Energy Research and Production to the Committee on Science and Technology, 99th Congress, 1st Session, Dec. 1985
(GPO-55-987) Avail: US Capitol, House Document Room

Concerns and interests in the development of space nuclear power systems for civilian and defense applications were reaffirmed. Government policy issues affecting the potential implementation of such systems were addressed. The status of the technology was reviewed. Innovative approaches to development of advanced nuclear power systems for space were explored. B.G.

N86-21299# Naval Research Lab., Washington, D. C.
BEAM TRAPPING IN A MODIFIED BETATRON WITH TORSATRON WINDINGS
C. A. Kapetanakos, D. Dialetis, and S. J. Marsh 5 Nov. 1985 48 p
(RR0-1109)
(AD-A161696; NRL-MR-5619) Avail: NTIS HC A03/MF A01 CSCL 20/7

The guiding center equations for the reference electron that is located at the centroid of an intense electron ring confined in a torsatron assisted modified betatron field are derived by time averaging out its fast motion. These slow equations are integrated analytically to obtain the nonlinear orbits for the guiding center. In addition, from the guiding center equations we have obtained a nonlinear expression that predicts very accurately the ring equilibrium position even for large displacement from the minor axis of the torus. These results have provided an invaluable insight in the development of a trapping scheme. The proposed scheme is compatible with the slow acceleration of the modified betatron and is based on a low amplitude, rapidly varying magnetic field that shifts the ring equilibrium position from near the wall to the minor axis of the torus in time shorter than a beam bounce period. GRA

N86-21300# Naval Research Lab., Washington, D. C.
STOCHASTICITY OF PARTICLE ORBITS IN A COLLECTIVE PARTICLE ACCELERATOR Memorandum Report, Sep. 1984 - Sep. 1985
G. Ganguli, H. G. Mitchell, Jr., and P. J. Palmadesso 6 Dec. 1985 24 p
(RR0-1107; RR0-1109)
(AD-A162418; NRL-MR-5664) Avail: NTIS HC A02/MF A01 CSCL 20/7

A detailed investigation of the behavior of particle orbits in the simultaneous presence of three large amplitude waves such as those encountered in the Collective Particle Accelerator (CPA) experiment is undertaken. Stochasticity arising out of the resonance overlap of the waves can influence the particle dynamics significantly and thereby affect the outcome of the experimental results. Choice of initial phase and energy for successful operation is identified and discussed. GRA

N86-21301# Fermi National Accelerator Lab., Batavia, Ill.
IMPEDANCES OF THE SHIELDED BELLOWS IN THE SSC AND THE EFFECTS ON BEAM STABILITY
King Yuen Ng Jul. 1985 18 p
(DE85-017364; FNAL-TM-1339) Avail: NTIS HC A02/MF A01

The 1.08 km of bellows in Design A of the SSC (Superconducting Super Collider) will contribute to single-bunch instabilities: i.e., in transverse mode-coupling, bellow contribution Z bar (perpendicular) = 68 mega ohm/m, and allowance for stability Z bar (perpendicular) < 120 mega ohm/m; in transverse microwave (for borad band at 13 GHz), bellow contribution Z (perpendicular) = 174 mega ohm/m, and allowance for stability Z (perpendicular) < 1287 mega ohm/m; in longitudinal microwave, bellow contribution Z (parallel)/n = 2.3 ohms and allowance for stability Z (parallel)/n < 4.7 ohms. In the above, it is assumed that an average single-bunch current I = 7.7 microA, RMS energy spread sigma sub E = 1.5x10 to the -4 power at injection energy of 1 TeV, RMS bunch length sigma sub iota = 7 cm, average betaron function beta bar = 150 m, and frequency slip actor eta = 1.3 x 10 to the -4th power. In order to support a stable bunch beam of

the designed intensity, the bellow corrugations must be shielded. The shielding itself also must have low impedances. Author

N86-21302# Brookhaven National Lab., Upton, N. Y.
NUCLEAR DATA AND RELATED SERVICES
J. K. Tuli 1985 6 p refs Presented at the 190th American Chemical Society National Meeting, Chicago, Ill., 8 Sep. 1985
(Contract DE-AC02-76CH-00016)
(DE85-017843; BNL-NCS-36975; CONF-850942-32) Avail: NTIS HC A02/MF A01

National Nuclear Data Center (NNDC) maintains a number of data bases containing bibliographic information and evaluated as well as experimental nuclear properties. An evaluated computer file maintained by the NNDC, called the Evaluated Nuclear Structure Data File (ENSDF), contains nuclear structure information for all known nuclides. The ENSDF is the source for the journal Nuclear Data Sheets which is produced and edited by NNDC. The Evaluated Nuclear Data File (ENDF), on the other hand is designed for storage and retrieval of such evaluated nuclear data as are used in neutronic, photonic, and decay heat calculations in a large variety of applications. Some of the publications from these data bases are the Nuclear Wallet Cards, Radioactivity Handbook, and books on neutron cross sections and resonance parameters. In addition, the NNDC maintains three bibliographic files: NSR - for nuclear structure and decay data related references, CINDA - a bibliographic file for neutron induced reactions, and CPBIB for charged particle reactions. Selected retrievals from evaluated data and bibliographic files are possible on-line or on request from NNDC. DOE

N86-21303# Pacific Northwest Lab., Richland, Wash.
NEUTRON SOURCE MULTIPLICATION METHOD
E. D. Clayton Aug. 1985 36 p Presented at the DOE Subcritical Reactivity Measurements Workshop, Albuquerque, N. Mex., 26 Aug. 1985
(Contract DE-AC06-76RL-01830)
(DE85-017930; PNL-SA-13357; CONF-8508105-3) Avail: NTIS HC A03/MF A01

The relationship between neutron multiplication and reactivity is discussed and data presented to illustrate problems associated with the absolute measurement of neutron multiplication and reactivity in subcritical systems. A number of curves of inverse multiplication have been selected from a variety of experiments showing variations observed in multiplication during the course of critical and subcritical experiments where different methods of reactivity addition were used, with different neutron source detector position locations. The inverse multiplication curves show that as the system approaches criticality, source, counter, and geometry effects become relatively small near delayed criticality and good estimates of criticality are possible by extrapolation of the curves. Concern is raised regarding the meaning and interpretation of k(sub eff) as might be measured in a far subcritical system because of the modal effects and spectrum differences that exist between the subcritical and critical systems. Because of this, the calculation of k(sub eff) identical to unity for a critical assembly, although necessary, may not be sufficient to assure safety margins in calculations pertaining to far subcritical systems. DOE

N86-21304# Los Alamos National Lab., N. Mex.
NEUTRON DIFFRACTION STUDIES OF BACTERIORHODOPSIN
J. Trewhella, J. L. Popot, D. M. Engelman, and G. Zaccai 1985 7 p refs Presented at the International Conference on Neutron Scattering, Santa Fe, N. Mex., 19 Aug. 1985 Prepared in cooperation with Yale Univ., New Haven, Conn. and Institut von Laue/Paul Langevin, Grenoble, France
(Contract W-7405-eng-36)
(DE86-000763; LA-UR-85-3268; CONF-850871-18) Avail: NTIS HC A02/MF A01

Neutron diffraction studies of bacteriorhodopsin have utilized the entire range of deuterium labeling techniques that are commonly used in biological neutron scattering experiments. We will review the work published in this area and report on current projects. DOE

N86-21305# Los Alamos National Lab., N. Mex.
PERFORMANCE PROGRAMMING WITH THE LOS ALAMOS MACRO ACCELERATOR
G. Cort 1985 23 p Presented at the 4th Semi-annual Meeting of the Softool User's Group, Santa Barbara, Calif., 30 Sep. 1985
(Contract W-7405-eng-36)
(DE86-000788; LA-UR-85-3129; CONF-8509179-1) Avail: NTIS HC A02/MF A01

The CCC macro facility, as extended by Version 2.0 of Softool's Change and Configuration Control Environment, offers many new and powerful features. Among these are a vastly extended suite of commands, error trapping, and structured constructs. In concert with previously existing Version 1.x features (notably the very powerful symbol substitution and parameter passage facilities), these features combine to transform the macro facility from a simple command language into an extremely flexible programming language which is suitable for developing very large and complex applications. This paper presents the results of a performance analysis of the CCC macro facility conducted at the Los Alamos National Laboratory Weapons Neutron Research Facility. The goal of this work was to identify and evaluate major factors that can contribute to the degradation of performance of the CCC macro facility, and to develop strategies for countering their effects. In particular, we report on the Los Alamos Macro Accelerator, which can produce dramatic increases in execution speed for many applications. DOE

N86-21306# Oak Ridge National Lab., Tenn.
RESIN BEADS AS A SAMPLE ACQUISITION AND LOADING MEDIUM FOR MASS SPECTROMETRIC ANALYSIS
R. L. Walker, D. H. Smith, H. S. McKown, H. C. Smith, and J. A. Carter Sep. 1985 55 p refs Revised
(Contract DE-AC05-84OR-21400)
(DE86-001451; ORNL/TM-5505/R1-Rev) Avail: NTIS HC A04/MF A01

This volume is a revised version of a previous edition of this work, Practical Aspects of the Resin Bead Technique for Mass Spectrometric Sample Loading. It has been updated to include current practice and expanded to cover more topics. Appendices are included to provide step-by-step instructions for many of the required operations. Among the developments reported herein are procedures for acquisition of samples in a hot cell, for loading one thousand beads with uranium and plutonium to reduce the chance of significant contamination, and for loading virtually any amount of sample from 1 ng to 1 (MU)g on each bead. DOE

N86-21307# Lawrence Livermore National Lab., Calif.
INITIAL MEASUREMENTS OF BEAM BREAKUP INSTABILITY IN THE ADVANCED TEST ACCELERATOR
Y. P. Chong, G. J. Caporaso, and K. W. Struve 13 May 1985 14 p Presented at the Particle Accelerator Conference, Vancouver, British Columbia, 13 May 1985
(Contract W-7405-eng-48)
(DE86-001583; UCRL-91938; CONF-850504-290) Avail: NTIS HC A02/MF A01

The measurements of beam breakup (BBU) instability performed on the Advanced Test Accelerator (ATA) up to the end of February, 1984 are discussed. The main objective was to produce a high current usable electron beam at the ATA output. A well-known instability is BBU which arises from the accelerator cavity modes interacting with the electron beam. The dominant mode is TM130 at a frequency of approximately 785 MHz. It couples most strongly to the beam motion and has been observed to grow in the Experimental Test Accelerator (ETA) which has only eight accelerator cavities. ATA has one hundred and seventy cavities and, therefore, the growth of BBU is expected to be more severe. BBU measurements are reported for ATA with beam currents of 4 to 7 kA. The injector BBU noise level for a field emission brush cathode was found to be an order of magnitude lower than for a cold plasma discharge cathode. These injector RF amplitudes agree very well with values obtained using the method of differenced B sub solar loops. DOE

N86-21308# Sandia National Labs., Albuquerque, N. Mex.
HERMES 3
D. E. Hasti, J. J. Ramirez, K. R. Prestwich, T. W. L. Sanford, and R. A. Hamil 1985 13 p Presented at the 6th JOWOG Meeting, Aldermaston, England, 7 Oct. 1985
(Contract DE-AC04-76DP-00789)
(DE86-001622; SAND-85-2154C; CONF-8510165-3) Avail: NTIS HC A02/MF A01

Hermes 3 is a major new gamma-ray simulator that is part of the Simulation Technology Laboratory Project. This accelerator will significantly improve the capability to evaluate the effects of gamma-ray radiation from nuclear weapons on weapons subsystems. This accelerator will be designed to produce 10(5)R, 5 x 10 to the 12th power R/S and 2 x 10 to the 20th power R/S(2) over a 500 sq cm area. The radiation dose will vary less than a factor of two over this area and less than a factor of four throughout a volume found by extending this surface 15 cm further from the gamma-ray converter. The minimum dose in this volume will be greater than or equal to 5 x 10 to the 4th power R. The accelerator will be designed with sufficient reliability and short enough turn-around time to produce more than 600 radiation pulses per year. In Hermes 3 the peak power in the beam is to be increased from 1.2 TW of Hermes 2 to 16 TW. Two techniques for achieving these high powers have been successfully developed. The first technique is a high current linear induction accelerator with several parallel beams. Experiments to evaluate this concept were done on the MABE accelerator. The second concept uses induction cavities and a magnetically insulated transmission line (MITL) to form a multi-terawatt voltage adder. DOE

N86-21309# Los Alamos National Lab., N. Mex.
FEYNMANN VARIANCE-TO-MEAN METHOD
E. J. Dowdy, G. E. Hansen, and A. A. Robba 1985 13 p Presented at the DOE Subcritical Reactivity Measurements Workshop, Albuquerque, N. Mex., 26 Aug. 1985
(Contract W-7405-eng-36)
(DE85-017529; LA-UR-85-3073; CONF-8508105-2) Avail: NTIS HC A02/MF A01

The Feynmann and other fluctuation techniques have been shown to be useful for determining the multiplication of subcritical systems. The moments of the counting distribution from neutron detectors is analyzed to yield the multiplication value. We present the methodology and some selected applications and results and comparisons with Monte Carlo calculations. DOE

N86-21310# Brookhaven National Lab., Upton, N. Y.
NEUTRON SCATTERING STUDIES OF HEAVY FERMIONS
S. M. Shapiro 1985 22 p Presented at the International Conference on Neutron Scattering, Santa Fe, N. Mex., 19 Aug. 1985
(Contract DE-AC02-76CH-00016)
(DE86-000628; BNL-36943; CONF-850871-17) Avail: NTIS HC A02/MF A01

Heavy Fermions are f electron materials characterized by a large linear term in the low temperature specific heat and a large magnetic susceptibility at low temperatures. This implies that there is a narrow peak in the f electron density of states at the Fermi energy. Typical examples are CeAl3, UBe13, CeCu2Si2, CeCu6, U2Zn17 and UPt3. Neutron scattering measurements can play an important role in understanding the magnetic interactions in these systems. Measurements of the form reveal details about the nature of the wave functions. Inelastic scattering studies gives information about the energy scale of the spin fluctuations and the narrow f-resonance. Such measurements on the above systems are reviewed with the goal of establishing systematics between the information obtained in neutron studies and that from bulk measurements. DOE

N86-21311# Nebraska Univ., Lincoln. Dept. of Chemistry.
ENERGETICS OF THE FORMATION AND REACTIONS OF GASEOUS IONS Annual Progress Report, 16 Sep. 1984 - 1 Sep. 1985
G. G. Meisels 1985 8 p
(Contract DE-AC02-76ER-02567)
(DE86-000639; DOE/ER-02567/T2) Avail: NTIS HC A02

High energy radiation leads to chemically measurable products by first producing electronically excited states or ions, and in the gas phase well over half of product formation can normally be ascribed to reactions of ionic precursors. Mechanisms responsible for product formation include both first order dissociation and second order or ion-molecule reactions. These mechanisms are examined via ionization by vacuum ultraviolet radiation. The four molecules examined are fluorobenzene, furan, formic acid and methyl formate. DOE

N86-21312# Brookhaven National Lab., Upton, N. Y.
TABLE OF RADIOACTIVE ELEMENTS
N. E. Holden 1985 2 p Presented at the 33rd IUPAC General Assembly, Lyon, France, 30 Aug. 1985
(Contract DE-AC02-76CH-00016)
(DE86-000649; BNL-NCS-36956; CONF-8508138-13) Avail: NTIS HC A02/MF A01

As has been the custom in the past, the Commission publishes a table of relative atomic masses and half-lives of selected radionuclides. The information contained in this table will enable the user to calculate the atomic weight for radioactive materials with a variety of isotopic compositions. The atomic masses have been taken from the 1984 Atomic Mass Table. Some of the half-lives have already been documented. DOE

N86-21313# Colorado Univ., Boulder. Nuclear Physics Lab.
PROPOSAL FOR INTERMEDIATE ENERGY NUCLEAR PHYSICS RESEARCH Progress Report
1 Oct. 1985 109 p
(Contract DE-AC02-81ER-40016)
(DE86-000733; DOE/ER-40016/4; NPL-1002) Avail: NTIS HC A06/MF A01

This report summarizes work carried out between October 1, 1984 and October 1, 1985 in the Nuclear Physics Laboratory of the Department of Physics at the University of Colorado, Boulder. This work is divided into two separate tasks, C and W. Task C covers intermediate energy physics in general and Task W supports study of the nucleon charge exchange reactions (p,n) and (n,p) at intermediate energies. Other efforts in the laboratory, such as LAMPF II accelerator development and several projects in low-energy nuclear physics, are described in this report. DOE

N86-21314# Los Alamos National Lab., N. Mex.
PION PRODUCTION CROSS SECTIONS AND ASSOCIATED PARAMETERS
J. N. Bradbury 1985 18 p refs Presented at the IAEA Advisory Group Meeting on Nuclear and Atomic Data for Radiotherapy and Radiobiology, Rijswijk, Netherlands, 16 Sep. 1985
(Contract W-7405-eng-36)
(DE86-000808; LA-UR-85-3366; CONF-8509178-1) Avail: NTIS HC A02/MF A01

Negative pions have been used for radiotherapy at the meson factories LAMPF (USA), SIN (Switzerland), and TRIUMF (Canada) and have been planned for use at new meson facilities under construction (USSR) and at proposed dedicated medical facilities. Providing therapeutically useful dose rates of pions requires a knowledge of the pion production cross sections as a function of primary proton energy (500 to 1000 MeV), pion energy (less than or equal to100 MeV), production angle, and target material. The current status of the data base in this area is presented including theoretical guidelines for extrapolation purposes. The target material and geometry, as well as the proton and pion beam parameters, will affect the electron (and muon) contamination in the beam which may have an important effect on both the LET characteristics of the dose and the dose distribution. In addition to cross-section data, channel characteristics such as length of pion trajectory, solid-angle acceptance, and momentum analysis will affect dose rate, distribution, and quality. Such considerations are briefly addressed in terms of existing facilities and proposed systems. DOE

N86-21315# Los Alamos National Lab., N. Mex.
PHYSICAL CONSTRAINTS ON MODELS OF GAMMA-RAY BURSTERS
R. I. Epstein 1985 20 p refs Presented at the International Astronomical Union (IAU) Colloquium, Copenhagen, Denmark, 11 Jun. 1985
(Contract W-7405-eng-36)
(DE86-000818; LA-UR-85-3331; CONF-8506205-1) Avail: NTIS HC A02/MF A01

The constraints that can be placed on models of gamma-ray burst sources based on only the well-established observational facts and physical principles are discussed. The premise is developed that the very hard X-ray and gamma-ray continua spectra are well-established aspects of gamma-ray bursts. Recent theoretical work on gamma-ray bursts are summarized with emphasis on the geometrical properties of the models. Constraints on the source models which are implied by the X-ray and gamma-ray spectra are described. The allowed ranges for the luminosity and characteristic dimension for gamma-ray burst sources are shown. Some of the deductions and inferences about the nature of the gamma-ray burst sources are summarized. DOE

N86-21316# Washington Univ., St. Louis, Mo.
HIGH-SPIN STRUCTURE OF Lu-163
K. Honkanen, H. C. Griffin, D. G. Sarantites, V. Abenante, L. A. Adler, C. Baktash, Y. S. Chen, O. Dietzsch, M. L. Halbert, and D. C. Hensley 1985 7 p refs Presented at the 190th American Chemical Society National Meeting, Chicago, Ill., 8 Sep. 1985 Prepared in cooperation with Michigan Univ., Ann Arbor; Oak Ridge National Lab., TN.; Pittsburgh Univ., PA.; Tennessee Univ., Knoxville
(Contract DE-AC05-84OR-21400)
(DE86-001349; CONF-850942-30) Avail: NTIS HC A02/MF A01

The (PI)1/2(+)[411] ground band structure of Lu-163 shows a large signature splitting with inversion above the backbend suggesting a shape change associated with the triaxiality degree of freedom. The (PI)1/2(-)[541] band shows no backbending up to h bar (LC OMEGA) = 0.4 MeV indicating a more deformed structure. DOE

N86-21317# Lawrence Livermore National Lab., Calif.
CALCULATIONAL TOOLS FOR THE EVALUATION OF NUCLEAR CROSS-SECTION AND SPECTRA DATA
M. A. Gardner May 1985 13 p refs Presented at the International Conference on Nuclear Data for Basic and Applied Science, Santa Fe, N. Mex., 13 May 1985
(Contract W-7405-eng-48)
(DE86-001559; UCRL-91947; CONF-850507-55) Avail: NTIS HC A02/MF A01

A technique based on discrete energy levels rather than energy level densities is presented for nuclear reaction calculations. The validity of the technique is demonstrated via theoretical and experimental agreement for cross sections, isomer-ratios and gamma-ray strength functions. DOE

N86-21318# Fermi National Accelerator Lab., Batavia, Ill.
WILL THE NEXT FIFTEEN YEARS OF HIGH ENERGY PHYSICS MATCH THE LAST FIFTEEN
J. D. Bjorken Sep. 1985 26 p Presented at the 10th Hawaii Topical Conference in Particle Physics, Honolulu, Hawaii, 26 Aug. 1985
(Contract DE-AC02-76CH-03000)
(DE86-001566; FNAL/C-85/133; CONF-8508139-1) Avail: NTIS HC A03/MF A01

A brief retrospective of advances in high energy physics made during the last 15 years, both theoretical and experimental, is given, followed by predictions for future work, which is said to include testing the standard model and exploring the Higgs sector. The theoretical methods available for understanding the Higgs sector are briefly discussed, as well as available experimental tools. DOE

N86-21319# Brookhaven National Lab., Upton, N. Y.
RESONANCES IN THE phi phi SYSTEM AND GLUEBALLS
S. J. Lindenbaum 1985 5 p refs Presented at the International Europhysics Conference on High Energy Physics, Bari, Italy, 18 Jul. 1985
(Contracts DE-AC02-83ER40107; DE-AC02-76CH-00016)
(DE86-001728; BNL-37067; CONF-850721-8) Avail: NTIS HC A02/MF A01

The mass spectrum and the final partial wave analysis of the OZI forbidden reaction (PI)(-)p (YIELDS) phi phi n are shown. A unique good fit solution was found which selected only three I (sup G) J (sub PC) = 0(+)2(2+) waves with J (sub z) sup e+a/ = 0(-) in the Gottfried Jackson frame. The partial wave amplitude and phase behavior clearly indicated resonant behavior. A three-pole K-matrix fit corresponded to a good fit whereas a two-pole fit was rejected. It is found that the disconnected Zweig diagram is due to a (PI)(+) annihilating the incident (PI)(-). A partial wave analysis of the background in the region slightly above the phi mass for the K(+)K(-) pair is given. The selective breakdown of the OZI suppressiion and the different nature of the OZI-allowed background are explained in the context of QCD by attributing the production of these states to 1-3 primary glueballs. DOE

N86-21320# Brookhaven National Lab., Upton, N. Y.
HEAVY ION INDUCED TRANSFER REACTIONS: A SPECTROSCOPIC TOOL FOR HIGH SPIN STATES
P. D. Bond 1985 6 p refs Presented at the 190th American Chemical Society National Meeting, Chicago, Ill., 8 Sep. 1985
(Contract DE-AC02-76CH-00016)
(DE86-001739; BNL-37078; CONF-850942-31) Avail: NTIS HC A02/MF A01

By selectively choosing the appropriate heavy ion transfer reaction high spin states can be accessed. As a demonstration of the technique two proton and two neutron states of high spin (both yrast and non-yrast) in Nd nuclei were identified. These spectroscopic results have yielded the first direct information about the configuration of some of these states. DOE

N86-21321# Brookhaven National Lab., Upton, N. Y.
NUCLEAR MASSES FAR FROM STABILITY: THE INTERPLAY OF THEORY AND EXPERIMENT
P. E. Haustein 1985 6 p Presented at the 190th American Chemical Society National Meeting, Chicago, Ill., 8 Sep. 1985
(Contract DE-AC02-76CH-00016)
(DE86-001741; BNL-37119; CONF-850942-29) Avail: NTIS HC A02/MF A01

Mass models seek, by a variety of theoretical approaches, to reproduce the measured mass surface and to predict unmeasured masses beyond it. Subsequent measurements of these predicted nuclear masses permit an assessment of the quality of the mass predictions from the various models. Since the last comprehensive revision of the mass predictions (in the mid-to-late 1970's) over 300 new masses have been reported. Global analyses of these data have been performed by several numerical and graphical methods. These have identified both the strengths and weaknesses of the models. In some cases failures in individual models are distinctly apparent when the new mass data are plotted as functions of one or more selected physical parameters. Several examples will be given. Future theoretical efforts will also be discussed. DOE

N86-21322# Brookhaven National Lab., Upton, N. Y.
LONG-LIVED HEAVY MASS ELEMENTS HALF-LIVES (A<125)
N. E. Holden 1985 19 p refs Presented at the 33rd IUPAC General Assembly, Lyon, France, 30 Aug. 1985
(Contract DE-AC02-76CH-00016)
(DE86-001742; BNL-NCS-36960; CONF-8508138-15) Avail: NTIS HC A02/MF A01

Reported values of half-lives of intermediate mass and heavy elements are evaluated. The evaluation analysis estimates the systematic error the resulting standard deviation. Recommended values are then presented for Te-128, Te-130, I-129, La-138,

Nd-144, Nd-145, Sm-146, Sm-147, Sm-148, Gd-152, Dy-154, Lu-176, Hf-174, Ta-180, Re-187, Os-186, Pt-190, Pb-204, Pb-205, and Th-230, Th-232. DOE

N86-21323# Brookhaven National Lab., Upton, N. Y.
LONG-LIVED LIGHT MASS ELEMENT HALF-LIVES (A>125)
N. E. Holden 1985 18 p refs Presented at the 33rd IUPAC General Assembly, Lyon, France, 30 Aug. 1985
(Contract DE-AC02-76CH-00016)
(DE86-001743; BNL-NCS-36959; CONF-8508138-16) Avail: NTIS HC A02/MF A01

Reported values of half-lives of light and intermediate mass elements are evaluated. The evaluation analysis estimates the systematic error and the resulting standard deviation. Recommended values are then presented for tritium, Be-10, C-14, Al-26, Ar-39, K-90, V-50, Mn-53, Ge-76, Rb-87, Nb-92, Pd-107, Cd-113, In-115, and Te-123. DOE

N86-21324# Brookhaven National Lab., Upton, N. Y.
TOTAL AND SPONTANEOUS FISSION HALF-LIVES FOR URANIUM AND PLUTONIUM NUCLIDES
N. E. Holden 1985 11 p refs Presented at the 33rd IUPAC General Assembly, Lyon, France, 30 Aug. 1985
(Contract DE-AC02-76CH-00016)
(DE86-001744; BNL-NCS-36961; CONF-8508138-17) Avail: NTIS HC A02/MF A01

Several reported experiments have been reanalyzed and recommended values are presented for /sup 232,233,234,235,236, 238/U and for /sup 236,238,239,240,241,242,244/Pu. These values improve upon previous preliminary estimates of both the half-lives and the standard deviations. DOE

N86-21325# Brookhaven National Lab., Upton, N. Y.
TOTAL AND SPONTANEOUS FISSION HALF-LIVES FOR AMERICIUM AND CURIUM NUCLIDES
N. E. Holden 1985 7 p refs Presented at the 33rd IUPAC General Assembly, Lyon, France, 30 Aug. 1985
(Contract DE-AC02-76CH-00016)
(DE86-001745; BNL-NCS-36962; CONF-8508138-14) Avail: NTIS HC A02/MF A01

The long-lived nuclides of the americium curium elements are of interest for their use in certain safeguard applications and for nuclear reactor burnup studies in waste management. Recommended values are presented for /sup 241,242m,243/Am, and for /sup 242,243,244,245,246,247,248,250/Cm. These values result from a consistent evaluation of all these half-lives. These preliminary estimates were presented earlier. The uncertainties are provided at the 95% confidence limit for each of the recommended values. It will be noted that many of the recommended errors considerably exceed errors quoted by individual authors in their publication, by up to an order of magnitude, e.g., the total half-life of /sup 242,246,248/Cm and the spontaneous fission half-life of (244)Cm. DOE

N86-21326# Stanford Linear Accelerator Center, Calif.
QCD MECHANISMS FOR HEAVY PARTICLE PRODUCTION
S. J. Brodsky Sep. 1985 18 p refs
(Contract DE-AC03-76SF-00515)
(DE86-001778; SU-SLAC-PUB-3770) Avail: NTIS HC A02/MF A01

For very large pair mass, the production of heavy quarks and supersymmetric particles is expected to be governed by ACD fusion subprocesses. At lower mass scales other QCD mechanisms such as prebinding distortion and intrinsic heavy particle Fock states can become important, possibly accounting for the anomalies observed for charm hadroproduction. We emphasize the importance of final-state Coulomb interactions at low relative velocity in QCD and predict the existence of heavy narrow four quark resonances (c c-bar u u-bar) and (cc c-bar c-bar) in (GAMMA) (GAMMA) reactions. Coherent QCD contributions are discussed as a contribution to the non-additivity of nuclear structure functions and heavy particle production cross sections. We also predict a new type of amplitude zero for exclusive heavy meson pair production which follows from the tree-graph structure of QCD. DOE

N86-21327# Bristol Univ. (England). Physics Lab.
STRUCTURE OF EQUIMOLAR LICl-AlCl3 MELT BY NEUTRON SCATTERING
S. Biggin, S. Cummings, J. E. Enderby, and M. Blander 1985 9 p refs Presented at the 5th International Symposium on Molten Salts, Las Vegas, Nev., 14 Oct. 1985 Prepared in cooperation with Argonne National Lab., Ill.
(Contract W-31-109-eng-38)
(DE86-001788; CONF-8510177-1) Avail: NTIS HC A02/MF A01

The structure of LiAlCl4 has been investigated by neutron diffraction of isotopically enriched samples. The lithium contribution to the scattering has been removed by using a null scattering sample, of Li-6 and Li-7. We have derived three partial structure factors S/sub AlAl/(k), S/sub ClCl/(k) and S/sub AlCl/(k) and their Fourier transforms, the partial radial distribution functions (rdf's), g/sub ij/(r). The first peaks in g/sub AlAl/(r), g/sub ClCl/(r) and g/sub AlCl/(r) are at 5.6, 3.51, and 2.13 A, respectively. The coordination numbers obtained by integrating to the first minima are about 6, 6, and 4, respectively. As anticipated, the existence of extremely well defined AlCl4(-) tetrahedra has been established, with little if any Al-Cl-Al bridging between tetrahedra in this melt. The results are similar to those predicted from molecular dynamical calculations on model systems. DOE

N86-21328# Argonne National Lab., Ill.
SURFACE SEGREGATION DURING IRRADIATION
L. E. Rehn and N. Q. Lam Oct. 1985 37 p refs Presented at the ASM Metals Congress International Conference on Surface Modifications, Toronto, Ontario, 13 Oct. 1985
(Contract W-31-109-eng-38)
(DE86-001789; CONF-8510160-5) Avail: NTIS HC A03/MF A01

Gibbsian adsorption is known to alter the surface composition of many alloys. During irradiation, four additional processes that affect the near-surface alloy composition become operative: preferential sputtering, displacement mixing, radiation-enhanced diffusion and radiation-induced segregation. Because of the mutual competition of these five processes, near-surface compositional changes in an irradiation environment can be extremely complex. Although ion-beam induced surface compositional changes were noted as long as fifty years ago, it is only during the past several years that individual mechanisms have been clearly identified. In this paper, a simple physical description of each of the processes is given, and selected examples of recent important progress are discussed. With the notable exception of preferential sputtering, it is shown that a reasonable qualitative understanding of the relative contributions from the individual processes under various irradiation conditions has been attained. However, considerably more effort will be required before a quantitative, predictive capability can be achieved. DOE

N86-21329# Argonne National Lab., Ill.
RELATIVISTIC NUCLEAR DYNAMICS
F. Coester 1985 15 p refs Presented at the Bates Users Theory Group Workshop, Cambridge, Mass., 9 Aug. 1985
(Contract W-31-109-eng-38)
(DE86-001818; CONF-8508140-1) Avail: NTIS HC A02/MF A01

A review is presented of three distinct approaches to the construction of relativistic dynamical models: (1) Relativistic canonical quantum mechanics. (The Hilbert space of states is independent of the interactions, which are introduced by modifying the energy operator.) (2) Hilbert spaces of manifestly covariant wave functions. (The interactions modify the metric of the Hilbert space.) (3) Covariant Green functions. In each of the three approaches the focus is on the formulation of the two-body dynamics, and problems in the construction of the corresponding many-body dynamics are discussed briefly. DOE

N86-21330# Northeastern Univ., Boston, Mass.
GAUGE THEORIES AND UNIFICATION OF ELEMENTARY PARTICLE INTERACTIONS Final Report, 1 May 1982 - 30 Jun.

1985
M. T. Vaughn Sep. 1985 7 p refs
(Contract DE-AC02-82ER-40059)
(DE86-001841; DOE/ER-40059/3) Avail: NTIS HC A02/MF A01

The calculation was completed of the two-loop (BETA)-functions (using dimensional regularization and the MS renormalization scheme) for the gauge, Yukawa and scalar quartic couplings in a general renormalizable quantum theory with scalar, spinor, and (vector) gauge fields. Radiative corrections to sin(2)theta/sub w/, the (MU) decay rate, and the electroweak rho parameter in grand unified theories with hidden sector supergravity were calculated. Limits were computed on the scalar neutrino mass from single photon production in e(+)e(-) annihilation. Vector boson decay modes of the nucleon were calculated in N = 1 supergravity models, including possible enhancements due to a heavy (m/sub t/ greater than or equal to 40 GeV) top quark. DOE

N86-21331# Lawrence Livermore National Lab., Calif.
REAL TIME ANALYSIS UNDER EDS
D. Schneberk Jul. 1985 20 p Presented at the Information Crossroads of the 80's, Washington, D.C., 8 Sep. 1985
(Contract W-7405-eng-48)
(DE85-016944; UCRL-92975; CONF-8509152-1) Avail: NTIS HC A02/MF A01

The analysis component of the Enrichment Diagnostic System (EDS) developed for the Atomic Vapor Laser Isotope Separation Program (AVLIS) at Lawrence Livermore National Laboratory (LLNL) is described. Four different types of analysis are performed on data acquired through EDS: (1) absorption spectroscopy on laser-generated spectral lines, (2) mass spectrometer analysis, (3) general purpose waveform analysis, and (4) separation performance calculations. The information produced from this data includes: measures of particle density and velocity, partial pressures of residual gases, and overall measures of isotope enrichment. The analysis component supports a variety of real-time modeling tasks, a means for broadcasting data to other nodes, and a great degree of flexibility for tailoring computations to the exact needs of the process. A particular data base structure and program flow is common to all types of analysis. Key elements of the analysis component are: (1) a fast access data base which can configure all types of analysis, (2) a selected set of analysis routines, (3) a general purpose data manipulation and graphics package for the results of real time analysis. DOE

N86-21332# Department of Energy, Washington, D. C. Div. of Nuclear Power Development.
COPROCESSING OF THERMAL REACTOR FUELS
W. W. Ballard, Jr. 1985 16 p
(DE85-017991; DOE/NBM-5017991; DOE-010) Avail: NTIS HC A02/MF A01

The Nuclear Power Development Division (NPD) under the Assistant Secretary for Energy Technology in the Department of Energy (DOE) is responsible for examining alternative nuclear reactor fuel recycle systems which have potential for reducing the risk of proliferation of nuclear weapons. NPD is administering a base technology program of research and development and design studies which will provide a sound technical foundation for evaluating the nonproliferation potential and commercial feasibility of these alternatives. The Savannah River Laboratory (SRL) has been assigned as the technical lead for those activities associated with the processing of thermal reactor fuel. In order to systematically identify technical requirements and design solutions, SRL periodically updates a Design Integration Study (DIS). The reference process being incorporated into the current DIS is coprocessing uranium and plutonium in a manner whereby pure plutonium is never available in a separate stream. As with other processes, coprocessing doesn't offer a technical fix for preventing proliferators. A flowsheet for this reference process is described with particular emphasis on technical issues and proliferation resistance advantages of coprocessing over conventional Purex processing. DOE

N86-21333# Oak Ridge National Lab., Tenn.
ORNL NPB TASKS
O. H. Crawford 1985 7 p Presented at the NPB Program Technical Interchange Meeting, Huntsville, Ala., 20 Aug. 1985
(Contract DE-AC05-84OR-21400)
(DE85-018066; CONF-8508133-1) Avail: NTIS HC A02/MF A01

ORNL's work on optical target return radiation is funded by AFWL, in connection with discrimination. Observation of the optical emission (visible, ultraviolet or low-energy X-ray) due to NPB bombardment may be a way to determine readily how much (if any) beam is on the target. One needs to know the beam is on target in order to discriminate. Since optical photons originate from very near the surface, they can be emitted from light targets (penaids) as well as from heavy ones. Also, the ability to focus is an important advantage in connection with maximizing signal and minimizing noise. Accomplishments include theoretical predictions of intensity and spectral distribution of optical photons from neutral H atom bombardment. Many physical mechanisms have been considered in these predictions, which cover the spectral range from visible and ultraviolet light to low-energy X-rays. Luminescence (i.e., from electron-hole recombination) is predicted to be potentially the strongest source of optical emission. Research was also performed on laser photodetachment in a magnetic field, electrical breakdown phenomena, and calculations of dose distributions in targets exposed to high-energy radiation. DOE

N86-21334# Department of Energy, Washington, D. C. Office of Safeguards and Security.
STRATEGIC SPECIAL NUCLEAR MATERIAL INVENTORY DIFFERENCES Semiannual Report, Apr. 1 - 30 Sep. 1984
Jul. 1985 26 p
(DE86-000051; DOE/DP-0001/16; SAR-16) Avail: NTIS HC A03/MF A01

This sixteenth periodic semiannual report of Inventory Differences (ID) covers the last six months of fiscal year 1984 (April 1, 1984, through September 30, 1984), for the Department of Energy (DOE) and DOE contractor facilities possessing significant quantities of strategic special nuclear material (SSNM). Inventory Differences are simply the differences between the amount of material shown in the accounting records and the amount of material reported in the physical inventory. These differences are generally due to errors in estimating material in unmeasurable form at the time of an inventory, unmeasurable holdup in equipment, measurement imprecisions, inaccuracies in initial determinations of SSNM produced or used in nuclear reactors, and inventory or bookkeeping errors. Both DOE and contractors operating DOE facilities carefully maintain, analyze, and investigate ID data. Inventory Differences are expected in nuclear material processing and are not, in and of themselves, evidence of lost or stolen material. On the other hand, ID analysis provides valuable information on the effectiveness of the safeguards system's physical protection and material control measures as well as a check on the process controls and material management procedures. If necessary, an operation may be shut down until an ID is resolved. DOE

N86-21335# California Univ., Berkeley. Lawrence Berkeley Lab.
TWO PHOTON PHYSICS WITH THE MARK II AT PEP
G. Gidal Jun. 1985 11 p Presented at the International Symposium on Multiparticle Dynamics, Kiryat Anavim, Israel, 1 Jun. 1985 Prepared in cooperation with Stanford Linear Accelerator Center, Menlo Park, CA.; Harvard Univ., Cambridge, Mass.
(Contract DE-AC03-76SF-00098)
(DE86-000616; LBL-19992; CONF-8506194-4) Avail: NTIS HC A02/MF A01

Measurements of the mass spectrum and angular distribution of high mass meson pairs produced in (GAMMA)(GAMMA) interactions are compared with QCD predictions. The radiative width (GAMMA(eta') (YIELDS) (GAMMA)(GAMMA)) is measured using three different eta' decay modes. Upper limits for the iota radiative width are given. DOE

N86-21336# California Univ., Berkeley. Lawrence Berkeley Lab.
RECENT PROGRESS IN APPLICATIONS OF HIGH ENERGY HEAVY ION BEAMS TO NUCLEAR STRUCTURES AND ATOMIC PHYSICS
T. J. M. Symons Aug. 1985 8 p Presented at the 2nd International Conference on Nucleus-Nucleus Collisions, Visby, Sweden, 10 Jun. 1985
(Contract DE-AC03-76SF-00098)
(DE86-000617; LBL-20136; CONF-850672-4) Avail: NTIS HC A02/MF A01

Some recent experiments at the Bevalac are discussed which demonstrate the usefulness of relativistic heavy ion beams for study of the nuclear structure of radioactive isotopes. DOE

N86-21337# California Univ., Berkeley. Lawrence Berkeley Lab.
TWO PHASE COOLING FOR SUPERCONDUCTING MAGNETS
P. H. Eberhard, G. A. Gibson, M. A. Green, R. R. Ross, R. G. Smits, J. D. Taylor, and R. D. Watt Aug. 1985 8 p Presented at the Cryogenic Engineering Conference and International Cryogenic Materials Conference, Boston, Mass., 12 Aug. 1985 Prepared in cooperation with Stanford Linear Accelerator Center, Menlo Park, Calif.
(Contract DE-AC03-76SF-00098)
(DE86-000619; LBL-19246; CONF-850814-24) Avail: NTIS HC A02/MF A01

A closed circuit tubular cooling system for superconducting magnets offers advantages of limiting boiloff and containing high pressures during quenches. Proper location of automatic valves to lower pressures and protect the refrigerator in the event of quenches is described. Theoretical arguments and experimental evidence are given against a previously suggested method to determine He two phase flow regimes. If loss of flow occurs due to some types of refrigeration failure and transfer lines have enough heat leak to warm up, quenches are induced when the flow is restored. Examples are taken from experience with the TPC magnet. DOE

N86-21338# California Univ., Berkeley. Lawrence Berkeley Lab.
ALADDIN UPGRADE DESIGN STUDY: SHIELDING
W. P. Swanson, P. M. DeLuca, Jr., R. A. Otte, and S. W. Schilthelm 23 Apr. 1985 100 p Prepared in cooperation with Wisconsin Univ., Madison and Wisconsin Univ., Stoughton
(Contract DE-AC02-76EV-01105)
(DE86-000847; DOE/EV-01105/318) Avail: NTIS HC A05/MF A01

The object of this shielding is to examine all aspects of Aladdin operation to ensure that adequate shielding is provided to meet the design objectives. To do this, we will look at shielding necessary for radiation produced during the injection process, during normal loss of the stored beam and during accidental loss of the stored beam. It will therefore be necessary to specify shielding not only at the ring, but also along the injection line and the optical beam lines. We will also give special attention to the occupation of the accelerator Vault during injection as this may be a desirable design option. In effect, two shielding plans will be presented, permitting estimates of cost and space requirements for both. DOE

N86-21339# Rockefeller Univ., New York.
HIGHLIGHTS OF ISR RESULTS
P. T. Cox 1985 15 p refs Presented at the International Symposium on Multiparticle Dynamics, Kiryat Anavim, Israel, 1 Jun. 1985
(Contract DE-AC02-81ER-40033)
(DE86-000874; DOE/ER-40033/89; CONF-8506194-2) Avail: NTIS HC A02/MF A01

A selection of recent results from experiments at the CERN Intersecting Storage Rings is presented, covering both pp and p anti p interactions. DOE

N86-21340# European Organization for Nuclear Research, Geneva (Switzerland).
HIGH TRANSVERSE ENERGY AND HIGH TRANSVERSE MOMENTUM EVENTS IN ANTI p p AND pp INTERACTIONS AT THE CERN INTERSECTING STORAGE RINGS
A. L. S. Angelis, G. Basini, H. J. Besch, R. E. Breedon, L. Camilleri, T. J. Chapin, R. L. Cool, P. T. Cox, C. vonGagern, and C. Grosso-Pilcher 1985 28 p Presented at the International Europhysics Conference on High Energy Physics, Bari, Italy, 18 Jul. 1985
(Contract DE-AC02-81ER-40033)
(DE86-000876; DOE/ER-40033/86; CONF-850721-6) Avail: NTIS HC A03/MF A01

A comparison between anti p p and pp interactions at radical s = 52.7 GeV is presented for a total neutral transverse energy (E sub T 0) trigger and for a high transverse momentum (p sub T) neutral cluster trigger. The rate of production of events in the range 6 LT E sub T 0 LT 20 GeV is observed to be 10% higher in anti p p collisions than in pp collisions. A study of the structure of the events shows this excess to be due to more isotropic events being produced in anti p p collisions. The ratio of the production cross section for single neutral clusters in anti p p and pp interactions in the range 1.25 LT p sub T LT 10 GeV/c does not significantly differ from unity. DOE

N86-21341# European Organization for Nuclear Research, Geneva (Switzerland).
PRELIMINARY RESULTS FROM EXPERIMENT UA-6 ON THE INCLUSIVE pi 0 SPECTRUM FROM ANTI p p COLLISIONS AT RADICAL s = 24.3 GeV
J. Antille, S. Baumann, A. Bernasconi, J. C. Berney, R. E. Breedon, L. Camilleri, R. L. Cool, P. T. Cox, L. Dick, and E. C. Dukes 1985 17 p refs Presented at the International Europhysics Conference on High Energy Physics, Bari, Italy, 18 Jul. 1985
(Contract DE-AC02-81ER-40033)
(DE86-000877; DOE/ER-40033/85; CONF-850721-7) Avail: NTIS HC A02/MF A01

We present a preliminary invariant cross section for inclusive pi 0 production in anti p p collisions at radical s = 24.3 GeV in the range 2.5 LT p sub T LT 4.5 GeV/c. DOE

N86-21342# Brookhaven National Lab., Upton, N. Y.
REEXAMINATION OF 2200 METER/SECOND CROSS SECTION EXPERIMENTS FOR NEUTRON CAPTURE AND FISSION STANDARDS
N. E. Holden and K. A. Holden 1985 6 p refs Presented at the 33rd IUPAC General Assembly, Lyons, France, 30 Aug. 1985
(Contract DE-AC02-76CH-00016)
(DE86-001191; BNL-NCS-36965; CONF-8508138-3) Avail: NTIS HC A02/MF A01

Neutron capture and fission reaction cross sections are usually measured relative to a standard basis. The most common absolute cross sections which are used in the thermal neutron energy region are (197)Au and (59)Co for capture reactions and (235)U and (239)Pu for fission reactions. Values for these four cross sections have been compiled and evaluated for the purpose of recommending standard values. DOE

N86-21343# Louisiana State Univ., Baton Rouge. Dept. of Physics and Astronomy.
SADDLE POINT INSTABILITY IN MODELS OF CHIRAL SYMMETRY BREAKING
R. W. Haymaker and T. Matsuki Aug. 1985 31 p
(Contract DE-AS05-77ER-05490)
(DE86-001326; DOE/ER-05490/69) Avail: NTIS HC A03/MF A01

The stability of models of chiral symmetry breaking based on truncated Schwinger-Dyson equations is examined, incorporating renormalization group improvement through a running coupling constant. A specific model confirms that all chiral symmetry breaking solutions correspond to saddle points of the effective potential functional. The instability can be traced to momentum scales in the range from intermediate to infrared. The region from intermediate to ultraviolet is a completely consistent picture of the energetics of candidate vacuum states. Further systematic patterns of solutions are presented. DOE

N86-21344# Oak Ridge National Lab., Tenn.
DETECTING ISOTOPIC RATIO OUTLIERS
C. K. Bayne and D. H. Smith 1985 10 p refs Presented at the 28th Oak Ridge National Laboratory Conference on Analytical Chemistry, Knoxville, Tenn., 1 Oct. 1985
(Contract DE-AC05-84OR-21400)
(DE86-001335; CONF-8510151-6) Avail: NTIS HC A02/MF A01

An alternative method is proposed for improving isotopic ratio estimates. This method mathematically models pulse-count data and uses iterative reweighted Poisson regression to estimate model parameters to calculate the isotopic ratios. This computer-oriented approach provides theoretically better methods than conventional techniques to establish error limits and to identify outliers. DOE

N86-21345# California Univ., Berkeley. Lawrence Berkeley Lab.
UNRESOLVED GAMMA RAYS FROM HIGH-SPIN STATES
F. S. Stephens Aug. 1985 17 p refs Presented at the 2nd International Conference on Nucleus-Nucleus Collisions, Visby, Sweden, 10 Jun. 1985
(Contract DE-AC03-76SF-00098)
(DE86-001401; LBL-20163; CONF-850672-6) Avail: NTIS HC A02/MF A01

The gamma-rays which are emitted from the highest spin states in nuclei cannot be resolved using present techniques. Nevertheless, methods are being developed to study nuclear structures in this spin range. For example, coincidence data has been used in the study of superdeformations and moments of inertia. While the general properties of these correlation plots are in accord with present expectations, there are several puzzling features of the data which require more study. One unresolved aspect concerns gamma-ray energy spreads in a given decay pathway. In addition, higher-order correlation methods are in various stages of inception. DOE

N86-21346# Centro Informazioni Studi Esperienze, Milan (Italy).
BEHAVIOR OF RADIONUCLEI IN WATER SUSPENSIONS [COMPORTAMENTO DEI RADIONUCLIDI NEI CONFRONTI DEL MATERIALE IN SOSPENSIONE]
G. Ciceri 1985 58 p refs In ITALIAN Presented at Corso di Radioecol. degli Ambienti Acquatici Conference, Como, Italy, 10-14 Jun. 1985 Sponsored by Ente Nazionale per l'Energia Electricca
(CISE-2693) Avail: NTIS HC A04/MF A01

The interactions of radioactive nuclei disolved in a water mass with the suspended matter are discussed. One possible measure is the distribution ratio (Kd) between the two matrices. The thermodynamic and kinetic aspects of the interactions are examined, as well as chemical and physical chemical parameters of water and particulate matter which have an influence on Kd. It is shown that the reproduction of real conditions in laboratory is extremely difficult. Criteria to follow when attempting an experimental approach are given. Author (ESA)

N86-21347# Centro Informazioni Studi Esperienze, Milan (Italy).
THE USE OF LOOP-SEALS FOR THE CONTROL OF THE OVERPRESSURES IN HYDRAULIC TRANSIENTS EVOLVING IN A SEA SERVICE WATER SYSTEM
D. Canetta, A. Capozza, and G. Iovino (Ente Nazionale per l'Energia Electricca, Rome, Italy) 1985 33 p ref Presented at 7th International Round Table on Hydraulic Transients in Power Stations, Alvkarleby, Sweden, 9-11 Sep. 1985 Sponsored by Ente Nazionale per l'Energia Electicca
(CISE-2708) Avail: NTIS HC A03/MF A01

The transient response following pump trip-offs and start-ups was investigated in the sea water system of a nuclear power plant. Specific care was devoted to water column separation and cavity collapse phenomena. A computer program designed for analysis of complex hydraulic networks was used. It is found that dangerous overpressures can be avoided by the use of loop seals. The design of the vacuum breaker valves of the loop seals and the optimization of overall transient behavior is discussed.
Author (ESA)

N86-20900# Joint Publications Research Service, Arlington, Va.
NUCLEAR PHYSICAL METHODS FOR DETERMINING CARBON IN OCEANIC SUSPENSIONS Abstract Only
I. Ya. Barit, L. Ye. Kuzmin, and B. A. Shnykin *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 22 Transl. into ENGLISH from Doklady Akademii Nauk SSSR (Moscow, USSR), v. 282, no. 3, May 1985 p 587-590 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

N86-20915# Joint Publications Research Service, Arlington, Va.
EARTH PHYSICIST DESCRIBES US NUCLEAR TEST MONITORING SYSTEM Abstract Only
In its USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 40 Transl. into ENGLISH from Izvestiya (Moscow, USSR), 23 Aug. 1985 p 5 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

74 OPTICS

Includes light phenomena.

N86-21348* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
OPTICAL STEREO VIDEO SIGNAL PROCESSOR Patent
Glenn D. Craig, inventor (to NASA) Issued 3 Dec. 1985 9 p Filed 9 Mar. 1983
(NASA-Case-MFS-25752-1; US-Patent-4,556,986; US-Patent-Appl-SN-473499; US-Patent-Class-382-42; US-Patent-Class-350-335; US-Patent-Class-356-4.5; US-Patent-Class-356-345; US-Patent-Class-358-88; US-Patent-Class-358-105; US-Patent-Class-358-125; US-Patent-Class-364-822) Avail: US Patent and Trademark Office CSCL 20F

An otpical video signal processor is described which produces a two-dimensional cross-correlation in real time of images received by a stereo camera system. The optical image of each camera is projected on respective liquid crystal light valves. The images on the liquid crystal valves modulate light produced by an extended light source. This modulated light output becomes the two-dimensional cross-correlation when focused onto a video detector and is a function of the range of a target with respect to the stereo camera. Alternate embodiments utilize the two-dimensional cross-correlation to determine target movement and target identification.
Official Gazette of the U.S. Patent and Trademark Office

N86-21349 Department of the Air Force, Washington, D.C.
WIDE ANGLE LENS FOR THE INFRARED DEDICATORY CLAUSE Patent
David E. Stoltzmann, inventor (to Air Force) Issued 24 Sep. 1985 4 p
(AD-D011964; US-Patent-4,542,954; US-Patent-Appl-SN-550698; US-Patent-Class-350-1.3) Avail: US Patent and Trademark Office CSCL 20/6

This rotationally symmetric optical sensor consists of six lens elements made selectively of the alkali halide materials KBr, C I, and KI. It has a wide field-of-view coverage of 60 degrees and operates in the middle infrared through the far infrared bands and extends well into the extreme infrared band. The combination of optical materials selected to be used effectively corrects the chromatic and monochromatic aberrations of the sensor. GRA

N86-21350 British Aerospace Dynamics Group, Bristol (England). Optics Research Dept.
ON THE DEVELOPMENT OF OPTICAL SLIP-RINGS, 2 Progress Report
A. G. Levenston and A. R. Tooth Oct. 1980 19 p refs
(BAe-BT-10955) Copyright. Avail: Issuing Activity

The feasibility of an optical slip-ring for use in an optical communication link is demonstrated. The light signals are conveyed to and from the optical slip-ring via fiber optics, offering the

advantages of large bandwidths and immunity to electromagnetic interference. A working optical slip-ring model was produced Insertion loss is 12 dB. The peak signal to noise ratio is 7:1 at which + or - 10% signal variation with rotation is measured. Methods of reducing insertion loss, increasing the signal to noise ratio and reducing the angular signal variation are suggested.
Author (ESA)

N86-21351*# Korsch Optics, Inc., Huntsville, Ala.
AN OPTICAL TECHNOLOGY STUDY ON LARGE APERTURE TELESCOPES Final Report
Dietrich Korsch Dec. 1985 26 p ref
(Contract NAS8-36610)
(NASA-CR-178725; NAS 1.26:178725) Avail: NTIS HC A03/MF A01 CSCL 20F

The difficult and crucial problem of selecting a suitable telescope concept for an advanced space observatory was examined. To this end two and four mirror telescopes were analyzed and compared. Both configurations are very practical and structurally similar. Parabolic primary and spherical primary four mirror telescope were compared with respect to their performance and the alignment sensitivities of the three correction mirrors. A 1 meter class afocal telescope system with lag angle compensation, to be used in a LIDAR experiment, was examined. B.G.

N86-21352*# Computer Technology Associates, Inc., Columbia, Md.
STATE OF THE ART SURVEY OF NETWORK OPERATING SYSTEMS DEVELOPMENT
7 Jun. 1985 224 p
(Contract NAS5-28583)
(NASA-CR-177853; NAS 1.26:177853) Avail: NTIS HC A10/MF A01 CSCL 20F

The results of the State-of-the-Art Survey of Network Operating Systems (NOS) performed for Goddard Space Flight Center are presented. NOS functional characteristics are presented in terms of user communication data migration, job migration, network control, and common functional categories. Products (current or future) as well as research and prototyping efforts are summarized. The NOS products which are revelant to the space station and its activities are evaluated. B.G.

N86-21353# State Univ. of New York, Buffalo. Dept. of Chemistry.
SURFACE PLASMON DISPERSION RELATION AND LOCAL FIELD ENHANCEMENT DISTRIBUTION FOR A DEEP SINUSOIDAL GRATING Interim Technical Report
Dan Agassi and Thomas F. George Dec. 1985 51 p
(Contract N00014-86-K-0043)
(AD-A162453; UBUFFALO/DC/85/TR-1) Avail: NTIS HC A04/MF A01 CSCL 20/6

Two features of light scattering from a deep lossless metallic sinusoidal grating are considered in the limit g/d approaches infinity, where g and d are the height and periodicity of the grating, respectively. It is found that the surface plasmon dispersion relation is comprised of two flat bands with a frequency gap Delta omega/omega sub p = sq rt. 2 - 1)/2, where omega sub p is the volume plasmon frequency. For the local field enhancement distribution at the grating's surface, the results show the existence of two qualitatively distinct domains, i.e., lamda >> d and lambda << denotes the radiation wavelength. In both domains, however, the local field enhancement is larger at the bottom of the troughs than at the top of the peaks. The dressed Rayleigh expansion is used throughout for the analysis. GRA

N86-21354# Massachusetts Inst. of Tech., Cambridge. Lab. of Electronics.
SWITCHABLE ZERO ORDER DIFFRACTION GRATINGS AS LIGHT VALVES Semiannual Report, 1 Apr. - 30 Sep. 1985
John Melngailis 11 Oct. 1985 4 p
(Contract N00014-84-K-0073)
(AD-A162464) Avail: NTIS HC A02/MF A01 CSCL 20/6

The goal of this project is to produce a light valve based on the cancellation of the zero order of diffraction. The light valve works by displacement of two facing gratings with respect to one another by half an operating period. The light valve is made of polyvinylidine fluoride (PVF2) a piezoelectric plastic. It is simple cheap and, in principle, mass producible into arrays to serve as a flat display or as a light modulator in optical signal processing.
GRA

N86-21355# California Univ., Berkeley. Lawrence Berkeley Lab.
SPECULAR AND DIFFUSE REFLECTION OF SOFT X-RAYS FROM MIRRORS
H. Hogrefe, R. P. Haelbich, and C. Kunz Aug. 1985 17 p Presented at the 2nd International Synchrotron Radiation Instrumentation Conference, Stanford, Calif., 29 Jul. 1985 Prepared in cooperation with Hamburg Univ., West Germany
(Contract DE-AC03-76SF-00098)
(DE86-000620; LBL-20116; CONF-850734-14) Avail: NTIS HC A02/MF A01

Measurements of surface scattering from plane mirrors with different degrees of roughness using soft X-rays are reported. Angle resolved distributions of s-polarized light, scattered in the plane of incidence, were obtained with a precise reflectometer for various angles of incidence and different wavelengths. The influence of the sample preparation and the optical constants on the scattering properties is shown. DOE

N86-21356# Sandia National Labs., Albuquerque, N. Mex.
HIGH BANDWIDTH APPLICATIONS OF PHOTONICS
J. Chang 1985 6 p Presented at the SPIE International Technical Symposium on Optical and Electro-optical Engineers, San Diego, Calif., 18 Aug. 1985
(Contract DE-AC04-76DP-00789)
(DE86-000862; SAND-85-1237C; CONF-850887-37) Avail: NTIS HC A02/MF A01

High-bandwidth analog applications are a new and very promising area of photonics. Photonics is fast becoming the lead technology in the study of single-shot, rapid-transient phenomena because the photonic equivalent of a conventional diagnostic system offers unsurpassed performance and value. DOE

N86-21357# Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Lab.
ON-LINE URANIUM DETERMINATION USING REMOTE FIBER FLUORIMETRY
R. A. Malstrom 1985 28 p Presented at the Du Pont Process Analytical Symposium, Wilmington, Del., 16 Oct. 1985
(Contract DE-AC09-76SR-00001)
(DE86-001831; DP-MS-85-39; CONF-8510178-1) Avail: NTIS HC A03/MF A01

Remote Fiber Fluorimetry (RFF) is being developed at Savannah River Laboratory for the on-line determination of uranium in plant process streams. A prototype system suitable for plant use has been designed and is being built. RFF has four major components: a laser, an optical fiber, an optrode, and a detector. Essentially, an optical fiber carries laser radiation from a laser to a process sampling point. An optrode (the optical analog of an electrode) couples the laser light into a sample solution. Fluorescence from the sample is collected by the optrode and goes back through the same fiber to a detector. DOE

N86-21358# Brookhaven National Lab., Upton, N. Y.
METROLOGY OF REFLECTION OPTICS FOR SYNCHROTRON RADIATION
P. Z. Takacs Sep. 1985 51 p Presented at the 2nd International Synchrotron Radiation Instrumentation Conference, Stanford, Calif., 29 Jul. 1985
(Contract DE-AC02-76CH-00016)
(DE86-001205; BNL-37050; CONF-850734-12) Avail: NTIS HC A04/MF A01

This paper reviews some of the experiences of the National Synchrotron Light Source in procuring grazing incidence optical components over the past several years. The specification process - how it is related to the function of the optic, and how it relates

to the metrology available during the manufacturing process and after delivery to the user's laboratory - is reviewed. Practical aspects of experiences with new technologies, such as single point diamond turning of metal mirrors and the use of SiC as a mirror material, are discussed. Recent advances in metrology instrumentation have the potential to move the measurement of surface figure and finish from the research laboratory into the optical shop, which should stimulate growth and interest in the manufacturing of optics to meet the needs of the synchrotron radiation user community. DOE

N86-21359# Technische Hogeschool, Delft (Netherlands). Lab. voor Technische Natuurkunde.
PHOTON ABSORPTION GRAPHS: 1 keV TO 10 MeV
V. R. Bom and R. W. Hollander Jan. 1983 28 p
(Stratech-83-1) Avail: NTIS HC A03/MF A01

Photon absorption graphs for H2 (liquid), He (liquid), Be, C, Al, Ar (gas), Fe, Cn, Ge, Kr (gas), Mo, Sn, Xe (gas), Dy, An, Pb, U, NaI, NE102A, Kapton, Mylar, Hostaphan, polyethylene, and BaF2 are presented. Author (ESA)

N86-21360# Joint Publications Research Service, Arlington, Va.
EAST EUROPE REPORT: SCIENCE AND TECHNOLOGY
30 Dec. 1985 43 p refs Transl. into ENGLISH from various East European articles
(JPRS-ESA-85-038) Avail: NTIS HC A03/MF A01

Progress in science and technology in East European countries is reported. Topics discussed include: international cooperation, computer systems, and science, electronics, electrical engineering, and solar energy conversion. For individual titles, see N86-21361 through N86-21361.

N86-21361# Joint Publications Research Service, Arlington, Va.
FORMATION OF SURFACE FIGURE DURING OPTICAL SURFACE POLISHING
A. Leitel *In its* East Europe Report: Science and Technology (JPRS-ESA-85-038) 30 Dec. 1985 p 4-13 refs Transl. into ENGLISH from Feingeraetetechnik (East Berlin, East Germany), v. 34, no. 7, 1985 p 313-316 (For primary document see N86-21360 11-74)
Avail: NTIS HC A03/MF A01

In the manufacturing of optical precision components special importance is given to the polishing operation because it is manufacturing. It has an important effect on the precision of optical surfaces. The essential parameters which characterize precision are the surface form and the fine surface figure which emerge from a continuous smoothing process. The formation of the fine surface figure during polishing which relates to the optical medium, glass, is discussed. Analogies to other materials may be discovered when the elementary structure of such materials is considered. The formation of the fine optical figure in polishing optical functional surface is a consequence of material separation processes and the mechanism of lapping and polishing theoretical conceptions which were developed to explain the polishing process and contain a proposed complex view of the elementary processes which are compared. Elementary friction-wear mechanisms and tribological parameters show that the formation of the optical fine figure in polishing optical glass can be described as a triboseparation.
Author

N86-20448# Joint Publications Research Service, Arlington, Va.
OPTICAL THICKNESS OF ATMOSPHERIC AEROSOL OVER SEA Abstract Only
K. S. Shifrin, V. M. Volgin, B. N. Volkov, O. A. Yershov, and A. V. Smirnov *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 65 Transl. into ENGLISH from Issledovaniye Zemli Iz Kosmosa (Moscow, USSR), no. 4, Jul. - Aug. 1985 p 21-30 Original language document was announced in IAA as A86-13278 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

N86-20919# Joint Publications Research Service, Arlington, Va.
REGULARITY OF STRUCTURE OF INHOMOGENEITIES OF SCATTERING OF OPTICAL RADIATION AND THEIR RELATIONSHIP TO METEOROLOGICAL PARAMETERS Abstract Only
Yu. A. Polkanov *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 44 Transl. into ENGLISH from Izvestiya Akademii Nauk SSSR: Fizika Atmosfery I Okeana (Moscow, USSR), v. 21, no. 7, Jul. 1985 p 720-725 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

N86-20924# Joint Publications Research Service, Arlington, Va.
DIALOG SYSTEM FOR NUMERICAL MODELING OF ENERGY LOSSES OF ATMOSPHERIC OPTICAL WAVES Abstract Only
V. Ye. Zuyev, Yu. S. Makushkin, A. A. Mitsel, L. I. Nesmelova, O. B. Rodimova, V. P. Rudenko, S. D. Tvorogov, K. M. Firsov, and N. Ye. Yakovlev *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 47-48 Transl. into ENGLISH from Doklady Akademii Nauk SSSR (Moscow, USSR), v. 283, no. 2, Jul. 1985 p 345-348 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

N86-20925# Joint Publications Research Service, Arlington, Va.
ONE METHOD FOR COMPENSATING DISTORTIONS CAUSED BY ATMOSPHERIC TURBULENCE Abstract Only
V. N. Filinov and G. P. Chernyy *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 48 Transl. into ENGLISH from Optika I Spektroskopiya (Leningrad, USSR), v. 58, no. 3, Mar. 1985 p 634-639 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N86-21362# Electricity Council, London (England). Overseas Relations Branch.
MASS SPECTROMETRY OF THE NEGATIVE GLOW OF A CYLINDRICAL HOLLOW CATHODE DISCHARGE
M. Pahl, W. Lindinger, and F. Howorka 13 Dec. 1985 35 p refs Transl. into ENGLISH from Zeitschrift fuer Naturforschung (West Germany), v. 27a, no. 4, 1972 p 678-692
(BLL-OA-Trans-3237-(C196.3)) Avail: NTIS HC A03/MF A01

Positive ions were extracted from the negative glow (NG) of a cylindrical hollow cathode discharge through a plane sampling probe and analyzed. The discharge was operated in pure Argon with about 0.1% of H2O. Principal ions were Ar+, Ar++, Ar2+, ArH+, H2O+, and H3O+. Individual ion currents were measured as functions of the probe potential U (sub b), at different discharge currents (2 to 7 mA) and gas pressures (0.05 to 0.5 torr). At probe potentials above +15 V no ions from the NG reached the probe, but electrons were accelerated so that ionization of the neutral gas could arise in and behind the orifice. The Ar++ current as a function of U (sub b) together with other results suggested the presence of very vast electrons. B.G.

N86-21363# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
LARGE PLASMASPHERIC ELECTRIC FIELDS AT L-2 BY THE S3-3 SATELLITE DURING STRONG GEOMAGNETIC ACTIVITY
W. D. Gonzalez, O. Pinto, Jr., O. Mendes, Jr., and F. S. Mozer (California Univ., Berkeley) Nov. 1985 14 p refs Submitted for publication Sponsored in part by Fundo Nacional de Desenvolvimento Cientifico e Tecnologico
(INPE-3705-PRE/845) Avail: NTIS HC A02/MF A01

Large plasmaspheric electric fields at L is approximately 2 measured by the S3-3 satellite during strong geomagnetic activity are reported. Since these measurements have amplitudes comparable to those of the local corotation electric field, during such events the plasmasphere is expected to get strongly altered event at such low L-values. Furthermore, those measurements could

contribute to the understanding of the physics of the convection/electric field penetration to the low latitude plasmasphere as well as the disturbed dynamo, during strong geomagnetic activity. For this purpose, critical parameters related to geomagnetic activity are also presented for the reported electric field events. Author

N86-21364# Nagoya Univ. (Japan). Inst. of Plasma Physics.
CRESCENT SHAPED TOKAMAK FOR COMPACT IGNITION
K. Yamazaki and W. T. Reiersen (Princeton Univ., N.J.) Dec. 1985 18 p refs
(IPPJ-754) Avail: NTIS HC A02/MF A01

A compact high beta tokamak configuration with crescent shaped (or boomerang shaped) cross section is proposed as a next generation ignition machine. This configuration with a small indentation but a large triangularity is more compact than the normal dee shaped design because of its high beta characteristics in the first-second transition regime of stability. This may also be a more reliable next generation compact device than the bean shaped design with large indentation and small triangularity, because this design does not rely on the second stability and is easily extendable from the present dee shaped design. Author

N86-21365# Nagoya Univ. (Japan). Inst. of Plasma Physics.
AXIAL ELECTRIC FIELD DRIVEN BY TEMPERATURE ANISOTROPY IN A BUMPY TORUS EQUILIBRIUM
C. S. Chang, T. Shoji, and Y. Ohara Nov. 1985 25 p refs
(IPPJ-753) Avail: NTIS HC A02/MF A01

Cyclotron heating effect on the axial equilibrium is studied in a bumpy torus geometry. It is found that the temperature anisotropy of warm heated species can generate axial potential variation along the magnetic field lines. The temperature anisotropy is analyzed with a bi-Maxwellian fluid model. Author

N86-21366# Arizona Univ., Tucson. Dept. of Chemistry.
COMPARISON OF A VERY HIGH FREQUENCY 148 MHz INDUCTIVELY COUPLED PLASMA TO A 27 MHz ICP Interim Report
B. D. Webb and M. B. Denton 26 Nov. 1985 51 p
(Contract N00014-83-K-0268)
(AD-A162452; TR-43) Avail: NTIS HC A04/MF A01 CSCL 20/9

Physical parameters and analytical performance are determined for an analytical (ICP) operated at 148 MHz, a frequency nearly three times higher than any previously reported. The iron (I) excitation temperatures are approximately 1.5 times lower and the electron densities are five times lower than 27 MHz. The consequences of these changes are lower analyte and background continuum emission intensities, such that the signal to background ratios are decreased at the higher frequency. Freedom from interferences and working curve linearity are unaffected while ease of sample introduction is improved. A shift towards atomic emission indicates a deviation farther from LTE at 148 MHz. These effects are attributed to the decrease in skin depth with increasing frequency. GRA

N86-21367# Oak Ridge National Lab., Tenn.
FEATURES OF SPHERICAL TORUS PLASMAS OF ULTRA-LOW ASPECT RATIO AND LARGE ELONGATION
Y. K.M. Peng 1985 4 p Presented at the 12th European Conference on Controlled Fusion and Plasma Physics, Budapest, Hungary, 2 Sep. 1985
(Contract DE-AC05-84OR-21400)
(DE85-017310; CONF-850927-6) Avail: NTIS HC A02/MF A01

High beta, good confinement and steady-state operation in compact configuration and at modest field have long been major goals of magnetic fusion energy research. Accomplishing these in a single device will permit cost-effective and attractive embodiments of future fusion reactors. The introduction of the spherical torus concept was so motivated to a large degree. An equally important motivation is its prospect of reducing cost and time of fusion research and development. In comparison with alternate confinement concepts of RFP and spheromak, a spherical torus experiment is expected to be similar in compactness, low field, and high beta; but with better, tokamak-like confinement times by more than an order of magnitude. DOE

N86-21368# GA Technologies, Inc., San Diego, Calif.
CHARGE EXCHANGE MEASUREMENTS ON THE DOUBLET III TOKAMAK
J. Lohr and C. J. Armentrout Aug. 1985 9 p Presented at the Course and Workshop on Basic Physical Processes in Fusion Plasmas, Varenna, Italy, 26 Aug. 1985
(Contract DE-AC03-84ER-51044)
(DE86-000311; GA-A-18113; CONF-850806-1) Avail: NTIS HC A02/MF A01

Two passive charge exchange analyzers were installed on the Doublet III tokamak. Both were of the E parallel B type, permitting H-D discrimination by mass. Deuterons with energies up to about 90 keV could be observed at the highest spectrometer magnetic fields available. Beam injection energy on Doublet III was typically 75 keV. One of the analyzers could scan across the beam injection angle of approximately 27 deg at the magnetic axis, while the other analyzer observed parallel neutral flux across nearly the entire cross section from about 10 cm inside the limiter to tangency radii of about 85 cm, intersecting the centerpost. Beam injection was angled toward the direction of positive plasma current and co-going particles were generally observed by both analyzers. When neutral beam power was increased in steps, generally the observed fast neutral flux did not increase proportionally at higher power levels. Flux bursts were observed in synchronism with limiter H (sub (ALPHA)) spikes at the low energy range of the parallel analyzer. The perpendicular analyzer, observing fast particles near their injected pitch angle, detected bursts at all energies, with especially pronounced correlation with H (sub (ALPHA)) activity at high energies. DOE

N86-21369# California Univ., Berkeley. Lawrence Berkeley Lab.
CONCEPTS FOR INSERTION DEVICES THAT WILL PRODUCE HIGH-QUALITY SYNCHROTRON RADIATION
K. Halbach Jul. 1985 22 p Presented at the 2nd International Synchrotron Radiation Instrumentation Conference, Stanford, Calif., 29 Jul. 1985
(Contract DE-AC03-76SF-00098)
(DE86-000621; LBL-20174; CONF-850734-9) Avail: NTIS HC A02/MF A01

A simple analysis is presented that shows what effect the two major construction tolerances have on the field distribution in undulators, and it is shown that the consequential effects on the synchrotron radiation spectrum depend strongly on the type of undulator. A number of new conceptual undulator designs are described that allow electromagnetic correction of the field distribution in these undulators. DOE

N86-21370# Fermi National Accelerator Lab., Batavia, Ill.
THERMAL SHIELD BOWING IN LONG SUPERCONDUCTING MAGNETS
T. H. Nicol, M. Roman, and S. Fulton Sep. 1985 9 p Presented at the Cryogenic Engineering Conference and International Cryogenic Materials Conference, Boston, Mass., 12 Aug. 1985
(DE86-000643; FNAL-TM-1351; CONF-850814-14) Avail: NTIS HC A02/MF A01

One of the interesting problems associated with building long magnets for the SSC (Superconducting Super Collider) is predicting and controlling the dynamic response of the cryostat tubes during cooldown. Thermal bowing occurs in any of these tubes that are asymmetric in shape or which are not cooled uniformly. Understanding the bowing behavior is important for two reasons. First, one needs to know the magnitude of the induced displacements so that potential interferences in the entire magnet assembly can be located. Second, the bowing phenomenon introduces structural loads on the supports which need to be folded into the design of those supports. It is desirable, due to cost and time constraints, to develop an analytical model which accurately predicts loads and displacements rather than relying on a physical model of each candidate cryostat tube design. This report describes a

procedure and an analytical model to predict this dynamic behavior on the thermal radiation shield for Fermilab's proposed SSC magnet design. The results are compared with test data obtained on a physical model fabricated and tested in an effort to verify the analytical approach. DOE

N86-21371# Lawrence Livermore National Lab., Calif. Space Systems Div.

DESIGN AND FABRICATION OF THE MFTF-B MAGNET SYSTEM

R. E. Tatro and T. A. Kozman Sep. 1985 6 p Prepared in cooperation with Lawrence Livermore National Lab., Calif.

(Contract W-7405-eng-48)

(DE86-000742; UCRL-15718) Avail: NTIS HC A02/MF A01

The MFTF-B superconducting magnet system consists of 40 NbTi magnets and two Nb3Sn magnets. General Dynamics (GD) designed all magnets except for the small trim coils. GD then fabricated 20 NbTi magnets, while LLNL fabricated 20 NbTi magnets and two Nb3Sn magnets. The design phase was completed in February 1984 and included the competitive procurement of magnet structural fabrication, superconductor, G-10CR insulation, support struts and bearings, vapor-cooled leads, and thermal shields for all magnets. Fabrication of all magnets was completed in March 1985. At GD, dual assembly lines were necessary during fabrication in order to meet the aggressive LLNL schedule. The entire magnet system has been installed and aligned at LLNL, and Tech Demo tests will be performed during September and November 1985. DOE

N86-21372# Los Alamos National Lab., N. Mex.

SUMMARY FROM WORKING GROUP ON NONINTERCEPTIVE DIAGNOSTICS

D. D. Chamberlin 1985 4 p Presented at the Workshop on High Brightness, High Current, High Duty Factor Ion Injectors, San Diego, Calif., 21 May 1985

(Contract W-7405-eng-36)

(DE86-000790; LA-UR-85-2942; CONF-8505164-9) Avail: NTIS HC A02/MF A01

The working group for noninterceptive diagnostics spent much of its time comparing diagnostic techniques from different fields and their possible application to high-power injectors. The group included backgrounds from electron beam diagnostics, fusion power diagnostics, CW ion source and transport design, and ion beam of diagnostics. The probability of success for adapting techniques from these different areas is quite difficult to judge, short of a detailed examination of each application. Unexpected flaws or unforeseen noise sources can eliminate an idea that would otherwise appear promising. The report presents several ideas that were discussed, with an indication of those ideas most likely to succeed if implemented. DOE

N86-21373# Massachusetts Inst. of Tech., Cambridge. Plasma Fusion Center.

TRAPPED ELECTRON STOCHASTICITY BY FREQUENCY-MODULATED WAVES

A. K. Ram, K. Hizanidis, and A. Bers Aug. 1985 13 p

(Contract DE-AC02-78ET-51013)

(DE86-001315; PFC/JA-85-27) Avail: NTIS HC A02/MF A01

It is shown that for electrons trapped in a static potential a finite amplitude frequency-modulated wave induces stochastic motions (and diffusion) in electron orbits over a significantly larger area of phase-space than a single frequency wave of the same amplitude. The wavelength of the FM fields is unimportant if it is greater than twice the width of the static potential. It is proposed that this be used for pumping of mirror trapped electrons to enhance the confining potential in a tandem mirror cell. DOE

N86-21374# Oak Ridge National Lab., Tenn.

MHD STABILITY OF TORSATRONS USING THE AVERAGE METHOD

J. A. Holmes, B. A. Carreras, L. A. Charlton, L. Garcia, T. C. Hender, H. R. Hicks, and V. E. Lynch 1985 19 p Presented at the Course and Workshop on Basic Physical Processes in Fusion Plasmas, Varenna, Italy, 26 Aug. 1985

(Contract DE-AC05-84OR-21400)

(DE86-001348; CONF-850806-2) Avail: NTIS HC A02/MF A01

The stability of torsatrons is studied using the average method, or stellarator expansion. Attention is focused upon the Advanced Toroidal Fusion Device (ATF), an $l = 2$, 12 field period, moderate aspect ratio configuration which, through a combination of shear and toroidally induced magnetic well, is stable to ideal modes. Using the vertical field (VF) coil system of ATF it is possible to enhance this stability by shaping the plasma to control the rotational transform. The VF coils are also useful tools for exploring the stability boundaries of ATF. By shifting the plasma inward along the major radius, the magnetic well can be removed, leading to three types of long wavelength instabilities: (1) A free boundary edge mode occurs when the rotational transform at the plasma edge is just less than unity. This mode is stabilized by the placement of a conducting wall at 1.5 times the plasma radius. (2) A free boundary global kink mode is observed at high (BETA). When either (BETA) is lowered or a conducting wall is placed at the plasma boundary, the global mode is suppressed, and (3) an interchange mode is observed instead. For this interchange mode, calculations of the second, third, etc., most unstable modes are used to understand the nature of the degeneracy breaking induced by toroidal effects. Thus, the ATF configuration is well chosen for the study of torsatron stability limits. DOE

N86-21375# Oak Ridge National Lab., Tenn.

JET-ISX-B BERYLLIUM LIMITER EXPERIMENT SAFETY ANALYSIS REPORT AND OPERATIONAL SAFETY REQUIREMENTS

P. H. Edmonds Sep. 1985 68 p

(Contract DE-AC05-84OR-21400)

(DE86-001465; ORNL/TM-9512) Avail: NTIS HC A04/MF A01

An experiment to evaluate the suitability of beryllium as a limiter material has been completed on the ISX-B tokamak. The experiment consisted of two phases: (1) the initial operation and characterization in the ISX experiment, and a period of continued operation to the specified surface fluence (10 to the 22d power atoms/sq cm of hydrogen ions; and (2) the disassembly, decontamination, or disposal of the ISX facility. During these two phases of the project, the possibility existed for beryllium and/or beryllium oxide powder to be produced inside the vacuum vessel. Beryllium dust is a highly toxic material, and extensive precautions are required to prevent the release of the beryllium into the experimental work area and to prevent the contamination of personnel working on the device. Details of the health hazards associated with beryllium and the appropriate precautions are presented. Also described in appendixes to this report are the various operational safety requirements for the project. DOE

N86-21376# Massachusetts Inst. of Tech., Cambridge. Plasma Fusion Center.

OPTIMIZATION OF GYROKLYSTRON EFFICIENCY

T. M. Tran, B. G. Danly, K. E. Kreischer, J. B. Schutkeker, and R. J. Temkin Feb. 1985 33 p

(Contract DE-AC02-78ET-51013)

(DE86-001609; PFC/JA-85-8) Avail: NTIS HC A03/MF A01

The optimization of gyroklystron efficiency is investigated by employing a two-step procedure. As a first step, the prebuncher is analyzed using a small signal approximation, since the cavity(ies) here serve mainly to modulate slightly the velocities of the electrons, which will be bunched in the field-free drift section(s). It is found that the electrons entering the energy extraction cavity can be characterized entirely by only two dimensionless parameters: a bunching parameter q and a relative phase psi. The numerical simulation of the extraction cavity, based on the nonlinear pendulum equations describing the interaction between the electrons and the RF field, supplemented by the initial conditions specified by q and psi, constitutes the second step. The final result of this two-step analysis is the efficiency, eta/sub perpendicular, opt optimized with respect to q, psi and the magnetic detuning parameter (DELTA). This efficiency depends only on the

normalized cavity length (MU) and the normalized RF field F of the energy extraction section. DOE

N86-21377# Texas Univ., Austin. Fusion Research Center.
DESTABILIZATION OF GLOBAL ALFVEN EIGENMODES AND KINETIC ALFVEN WAVES BY ALPHA PARTICLES IN A TOKAMAK PLASMA
Y. M. Li, S. M. Mahajan, and D. W. Ross Sep. 1985 62 p
(Contracts DE-AS05-85ER-53193; DE-AC05-76ET-53036)
(DE86-001678; DOE/ET-53193/2-276; FRCR-276) Avail: NTIS HC A04/MF A01

Alfven wave instabilities in a reacting tokamak plasma are calculated both analytically and numerically. Two distinct classes of eigenmodes are considered, global Alfven eigenmodes and kinetic Alfven waves, each driven unstable by the free energy associated with the alpha particle density gradient. The growth rates of the global Alfven eigenmodes are given for the first time. These are basically MHD modes, whose resonances with electrons and alpha particles are calculated using kinetic theory. depend on electron inertia and finite ion gyroradius for their existence and have no counterpart in MHD theory. Global modes with small parallel phase velocity are identified as the most dangerous, both because of their substantial growth rates and the expected ineffectiveness of quasilinear stabilization. The kinetic waves, on the other hand, are likely to be stabilized easily by quasilinear flattening of the alpha particle profile. DOE

N86-21378# Texas Univ., Austin. Inst. for Fusion Studies.
STUDY OF THE MAGNETIC COMPRESSIONAL MODE IN A HOT PARTICLE PLASMA
D. P. Stotler, H. L. Berk, and M. G. Engquist Sep. 1985 25 p
(Contract DE-FG05-80ET-53088)
(DE86-001784; DOE/ET-53088/208; IFSR-208) Avail: NTIS HC A02/MF A01

The integral equation for the magnetic compressional mode, accounting for geometrical effects along the field line and using the eikonal approximation across the field line, is solved numerically for the eigenvalues and eigenfunctions. These results reproduce the analytic estimates when there is strong drift reversal. For typical EBT-S parameters, instability is observed for all pressure scale lengths just below those needed for drift reversal, i.e., vertical bar Rpar. delta (P (sub c) + P/sub perpendicular h)) /2B(2)par. deltar vertical bar > 1 (where P is the particle pressure, c and h refer to cold and hot components, B is the midplane magnetic field, and R is the midplane radius of curvature). If larger core densities are present, a wave-particle resonance arises when the particle drifts are not reversed, causing instability up to much larger pressure scale lengths. Stability for all values of the ratio of hot electron density to core density is obtained with vertical bar Rpar. deltaP/sub c) /B(2)par. deltar vertical bar > 1 + P (sub parallel h) /P (sub perpendicular h). DOE

N86-21379# Massachusetts Inst. of Tech., Cambridge. Plasma Fusion Center.
AXISYMMETRIC PUMPING SCHEME FOR THE THERMAL BARRIER IN A TANDEM MIRROR
X. Z. Li Sep. 1985 38 p
(Contract DE-AC02-78ET-51013)
(DE86-002001; DOE/ET-51013/159; PFC/RR-85-19) Avail: NTIS HC A03/MF A01

An axisymmetric pumping scheme is proposed to pump the particles that trap in a thermal barrier without invoking the neutral beam or geodesic curvature. In this scheme a magnetic scraper is moved uni-directionally on the barrier peak to push the barely trapped particles into the central cell. We utilize a potential jump that forms at the peak field for sufficiently strong pumping. The non-collisional catching effect has to be limited by setting an upper limit on the scraping frequency of the magnetic bump. On the other hand, the dynamic stability of the pumping scheme sets a lower limit on the scraping frequency. Using the variational method, we are able to estimate the window between these two limits, which seems feasible for the Tara reactor parameter set. A primary calculation shows that the magnetic bump, (DELTA)B/B is about 10(-4) and the scraping frequency, nu/sub sc/, is about 10(+5)sec(-1), which are similar to the parameters required for those for drift pumping. DOE

N86-21380# Lawrence Livermore National Lab., Calif.
TRANSIENT PLASMA ESTIMATION: A NOISE CANCELLING-IDENTIFICATION APPROACH
J. V. Candy, T. Casper, and R. Kane Mar. 1985 21 p Presented at the 24th IEEE Conference on Decision and Control, Fort Lauderdale, Fla., 11 Dec. 1985
(Contract W-7405-eng-48)
(DE85-008962; UCRL-92334; CONF-851209-1) Avail: NTIS HC A02/MF A01

The application of a noise cancelling technique to extract energy storage information from sensors occurring during fusion reactor experiments on the Tandem Mirror Experiment-Upgrade (TMX-U) at the Lawrence Livermore National Laboratory (LLNL) is examined. We show how this technique can be used to decrease the uncertainty in the corresponding sensor measurements used for diagnostics in both real-time and post-experimental environments. We analyze the performance of algorithm on the sensor data and discuss the various tradeoffs. The algorithm suggested is designed using SIG, an interactive signal processing package developed at LLNL. DOE

N86-21381# Massachusetts Inst. of Tech., Cambridge. Plasma Fusion Center.
LOWER HYBRID CURRENT DRIVE EXPERIMENTS ON THE MIT ALCATOR C AND VERSATOR II TOKAMAKS
S. Knowlton, S. McDermott, M. Porkolab, Y. Takase, S. Texter, P. Bonoli, C. Fiore, S. McCool, M. Mayberry, and K. I. Chen Aug. 1985 6 p Presented at the 12th European Conference on Controlled Fusion and Plasma Physics, Budapest, Hungary, 2 Sep. 1985
(Contract DE-AC02-78ET-51013)
(DE86-001109; DOE/ET-51013/T157; PFC/CP-85-6; CONF-850927-7) Avail: NTIS HC A02/MF A01

Energy confinement studies in lower hybrid RF driven discharges at 4.6 GHz have been carried out on the Alcator C tokamak. The electron temperature profile is measured by a five point Thomson scattering system and the ion temperature by charge-exchange analysis. The energy content of the bulk plasma is found to be similar for RF-driven and ohmic discharges of identical current and density. In the parameter range anti n(sub e) = 3 - 7 x 10 to the 13th power/cu cm, B = 7 - 11 T, I(sub p) = 100 - 200 kA, q (a) > 8, the RF power needed to sustain the discharge is significantly greater than the ohmic power required to maintain a similar plasma. The gross energy confinement time is lower in the RF-driven discharges than in the ohmic ones by a factor of 1.5 to 4, depending on plasma conditions. The frequency scaling of the density limit for current drive is reported from the Versator II tokamak. The steady-state current drive density limit of anti n(sub e) = 6 x 10 to the 12th power/cu cm at 800 MHz. has been raised to a density of at least anti n(sub e) = 1.0 x 10 to the 13th power/cu cm at the same toroidal field by operations at a frequency of 2.45 GHz. Superthermal electron effects during RF injection are observed up to a density of anti n(sub e) = 2.5 x 10 to the 13th power/cu cm. DOE

N86-21382# Massachusetts Inst. of Tech., Cambridge. Plasma Fusion Center.
ANALYTICAL MODEL FOR THE PERPENDICULAR TEMPERATURE ENHANCEMENT IN LOWER-HYBRID CURRENT DRIVE
K. Hizanidis, A. Bers, V. Fuchs, and R. A. Cairns Aug. 1985 12 p
(Contract DE-AC02-78ET-51013)
(DE86-001113; PFC/JA-85-28) Avail: NTIS HC A02/MF A01

The enhancement of the perpendicular temperature inside the resonant region, observed in numerical studies of the two-dimensional Fokker-Planck equation, combined with unidirectional RF quasilinear diffusion, is modeled on the basis of the collisional relaxation equations. Strong RF diffusion is assumed and relativistic effects are taken into account. The resulting enhanced per-

pendicular temperature is a function of the position and the width of the applied RF spectrum. Good agreement with two-dimensional Fokker-Planck numerical results has been found. DOE

N86-21383# Oak Ridge National Lab., Tenn.
ICRF WAVE PROPAGATION AND ABSORPTION IN TOKAMAK AND MIRROR MAGNETIC FIELDS: A FULL-WAVE CALCULATION
E. F. Jaeger, D. B. Batchelor, H. Weitzner, and J. H. Whealton 1985 71 p Presented at the 3rd European Workshop on Problems in the Numerical Modeling of Plasmas, Varenna, Italy, 10 Sep. 1985
(Contract DE-AC05-84OR-21400)
(DE86-001350; CONF-8509162-6) Avail: NTIS HC A04/MF A01

Global solutions for the ion cyclotron resonant frequency (ICRF) wave fields in a straight tokamak with rotational transform and a poloidally symmetric mirror are calculated in the cold plasma limit. The component of the wave electric field parallel to vector Bis assumed zero. Symmetry in each problem allows Fourier decomposition in one ignorable coordinate, and the remaining set of two coupled, two-dimensional partial differential equations is solved by finite differencing. Energy absorption and antenna impedance are calculated using a simple collisional absorption model. When large gradients in vertical barBvertical bar along vectorB are present in either geometry, ICRF heating at the fundamental ion cyclotron resonance is observed. For the mirror, such gradients are always present. But for the tokamak, the rotational transform must be large enough that vectorB . delB greater than or equal to 0(1). For smaller transforms more typical of real tokamaks, only heating at the two-ion hybird resonance is observed. This suggests that direct resonant absorption at the fundamental ion cyclotron resonance may be possible in stellarators where vectorB . delB approx. 0(1) + 11. DOE

N86-21384# Oak Ridge National Lab., Tenn.
CHARGE EXCHANGE PROCESSES INVOLVING IRON IONS
R. A. Phaneuf 1985 25 p Presented at the International Atomic Energy Agency (IAEA) Advisory Group Meeting on Atomic Data for Fusion Plasma Modelling, Vienna, Austria, 18 Sep. 1985
(Contract DE-AC05-84OR-21400)
(DE86-001353; CONF-8509180-1) Avail: NTIS HC A02/MF A01

A review and evaluation is given of the experimental data which are available for charge exchange processes involving iron ions and neutral H, H2 and He. Appropriate scaling laws are presented, and their accuracy estimated for these systems. A bibliography is given of available data sources, as well as of useful data compilations and review articles. A procedure is recommended for providing single approximate formulae to the fusion community to describe total cross sections for electron capture by partially-stripped Fe (sup q+) ions in collisions with H, H2 and He, based on the scaling relationships suggested by Janev and Hvelplund. DOE

N86-21385# Massachusetts Inst. of Tech., Cambridge. Plasma Fusion Center.
MASSACHUSETTS INSTITUTE OF TECHNOLOGY, PLASMA FUSION CENTER, 1984-1985. REPORT TO THE PRESIDENT
Jul. 1985 27 p
(Contract DE-AC02-78ET-51013)
(DE86-001476; DOE/ET-51013/T5) Avail: NTIS HC A03/MF A01

During the past year, technical progress has been made in all Plasma Fusion Center (PFC) research programs. The Plasma Fusion Center is recognized as one of the leading university research laboratories in the physics and engineering aspects of magnetic confinement fusion. Its research programs have produced significant results on four fronts: (1) the basic physics of high-temperature plasmas (plasma theory, rf heating, free electron lasers, development of advanced diagnostics and small-scale experiments on the Versator tokamak and Constance mirror devices); (2) major confinement results on the Alcator C tokamak, including pioneering investigations of the stability, heating, and confinement properties of plasmas at high densities, temperatures and magnetic fields; (3) development of an innovative design for axisymmetric tandem mirrors with inboard thermal barriers, with initial operation of the TARA tandem mirror experiment beginning in 1984; and (4) a broad program of fusion technology and engineering development that addresses problems in several critical subsystem areas (e.g., magnet systems, superconducting materials development, environmental and safety studies, advanced millimeter wave source development, and system studies of fusion reactor design, operation, and technology requirements). A review of these programs is given. DOE

N86-21386# Supercon, Inc., Shrewsbury, Mass.
DEVELOPMENT OF HIGH FIELD SUPERCONDUCTORS FOR FUSION ENERGY APPLICATIONS Final Report
26 Sep. 1985 21 p
(Contract DE-AC01-80ER-52068)
(DE86-001509; DOE/ER-52068/T1) Avail: NTIS HC A02/MF A01

The purpose of this project was to develop a conductor design and a manufacturing procedure for a composite multifilamentary Nb3Sn conductor suitable for winding a magnet for use in a fusion energy power plant. Effort was concentrated on the design of a conductor with tubular niobium filaments in a copper matrix. Bronze in the bores of the filaments would react with the niobium to form Nb3Sn on the inside diameter of the niobium tubular filaments during a heat treatment at final size. Four filament geometries were evaluated. The addition of titanium to the bronze was found to increase the current density. The use of a hydrogen atmosphere did not appear to cause any increase in current density. Primary billets were assembled and extruded with five tubular filament designs and for comparison, five rod type filament designs. Billet designs are described. DOE

N86-21387# Massachusetts Inst. of Tech., Cambridge. Plasma Fusion Center.
ELECTRIC PROBES IN PLASMAS
B. Lipschultz, I. Hutchinson, B. LaBombard, and A. Wan Aug. 1985 27 p Presented at the 32nd National Vacuum Symposium and Topical Conference, Houston, Tex., 19 Nov. 1985
(Contract DE-AC02-78ET-51013)
(DE86-001544; PFC/JA-85-29; CONF-851174-11) Avail: NTIS HC A03/MF A01

This paper provides a background for the use of Langmuir and gridded energy analyzer probes in diagnosing plasmas with varied characteristics. Theory is illustrated which governs the analysis of data from, and the design of these probes. Several probe analysis techniques and some of their typical problems are presented. DOE

N86-21388# Texas Univ., Austin. Inst. for Fusion Studies.
THREE DIMENSIONAL PARTICLE SIMULATION OF DRIFT WAVE FLUCTUATIONS IN A SHEARED MAGNETIC FIELD
R. D. Sydora, J. N. Leboeuf, D. R. Thayer, P. H. Diamond, and T. Tajima Aug. 1985 15 p
(Contract DE-FG05-80ET-53088)
(DE86-000236; DOE/ET-53088/201; IFSR-201) Avail: NTIS HC A02/MF A01

Three dimensional particle simulations of collisionless drift waves in sheared magnetic fields were performed in order to determine the nonlinear behavior of inverse electron resonance dynamics in the presence of thermal fluctuations. It is found that stochastic electron diffusion in the electron resonance overlap region can destabilize the drift wave eigenmodes. Numerical evaluations based on a nonlinear electron resonance broadening theory give predictions in accord with the frequency and growth rates found in the simulation of short wavelength modes (k sub y rho sub s greater than or equal to 1). DOE

N86-21389# Texas Univ., Austin. Inst. for Fusion Studies.
DIFFUSION INDUCED BY CYCLOTRON RESONANCE HEATING
S. Riyopoulos, T. Tajima, T. Hatori, and D. Pfirsch Sep. 1985 13 p

(Contract DE-FG05-80ET-53088)
(DE86-000858; DOE/ET-53088/184; IFSR-184-R) Avail: NTIS HC A02/MF A01

The wave induced particle transport during the ion cyclotron resonance heating is studied in collisionless toroidal plasmas. It is shown that the previously neglected non-conservation of the toroidal angular momentum IP sub phi caused by the toroidal wave component E sub phi is necessary to allow particle diffusion and yields the leading diffusive contribution. While the induced ion transport for the RF power in contemporary experiments is of the order of the neoclassical value, that of fast alpha particles is quite large if resonance is present. DOE

N86-21390# Brookhaven National Lab., Upton, N. Y.
COLD IRON COS THETA MAGNET OPTION FOR THE SSC
P. Reardon 1985 5 p Presented at the Particle Accelerator Conference, Vancouver, British Columbia, 13 May 1985
(Contract DE-AC02-76CH-00016)
(DE86-001175; BNL-36935; CONF-850504-287) Avail: NTIS HC A02/MF A01

The evolution over the past several years of a cold iron, high field cos theta magnet design option for the Superconducting Supercollider (SSC) is reviewed. The collaborative approach pursued by Brookhaven National Laboratory (BNL) and Lawrence Berkeley Laboratory (LBL) on the 2-in-1 option and the culmination of this effort in the tests of the BNL 4.5 m model magnets are noted. Finally, the subsequent 1-in-1 option being pursued jointly by BNL, Fermilab and LBL is discussed. DOE

N86-21391# Columbia Univ., New York. Plasma Physics Lab.
TOMOGRAPHIC ANALYSIS OF THE EVOLUTION OF PLASMA CROSS-SECTIONS
A. Holland and G. A. Navratil Sep. 1985 54 p
(Contract DE-AC02-76ET-53016)
(DE86-001227; DOE/ET-53016/88) Avail: NTIS HC A04/MF A01

A diagnostic has been developed for measurements of the evolution of plasma density distributions in 2D using the principles of computed emission tomography. The system measures the near infrared emission along several chords through the plasma cross-section and the emission profile is then reconstructed using a maximum entropy based algorithm. This paper will present details of the reconstruction algorithm; the data collection system; the verification of the diagnostic using both physical and numerical phantom sources; evidence for the correlation between n(2) and the infrared emission intensity; initial measurements on a tokamak plasma. DOE

N86-21392# Technische Hogeschool, Delft (Netherlands). Lab. voor Technische Natuurkunde.
STRONG AND ELECTROMAGNETIC INTERACTION IN PIONIC AND MUONIC ATOMS [STERKE EN ELECTROMAGNETISCHE WISSELWERKING IN PIONISCHE EN MUONISCHE ATOMEN]
C. T. A. M. deLaat Jan. 1983 39 p refs In DUTCH; ENGLISH summary
Avail: NTIS HC A03/MF A01

Preliminary runs at a synchrocyclotron and a medium energy accelerator to test detectors, electronics, and software for measurements on muonic and pionic atoms are described. The purpose of the measurements is to describe the nuclear matter density dependence of that part of the optical pion-nuclear potential that describes pion absorption. Measurements of quadrupole moments of nuclei in a model independent way were carried out. The pion/muon telescope and germanium detector with NaI anti-Compton background were tested and analyzed with the developed sotfware. Time of flight spectra were collected to determine the beam composition in the muon extraction channel. Results show good functioning of the instruments. In the time of flight spectra the presence of pions, muons, and positons is clearly demonstrated. Author (ESA)

N86-21393# FOM-Inst. voor Plasmafysica, Rijnhuizen, Jutphaas (Netherlands).
HEATING OF PLASMAS IN TOKAMAKS BY CURRENT-DRIVEN TURBULENCE
H. deKluiver Oct. 1985 18 p refs Sponsored by Euratom and Nederlands Organisatie voor Zuiver-Wetenschappelijk Onderzoek (ZWO)
(Rept-85-159) Avail: NTIS HC A02/MF A01

Anomalous resistivity and turbulent heating of plasmas are reviewed. Current-driven turbulence is classified. Pulsed turbulent heating results and energy confinement in tokamak experiments are discussed. Investigations of current-driven turbulence show the potential to heat plasmas to elevated temperatures in relatively small cross-section devices. Although it is shown to be possible to relax the technical requirements on the necessary electric field and the pulse length to acceptable values, the effect of energy generation near the plasma edge, the energy transport, the impurity influx, and the variation of the current profile are unknown for large-radius tokamaks. Heating of plasmas by quasi-stationary weakly turbulent states caused by moderate increases of the resistivity due to higher loop voltages could be envisaged.
Author (ESA)

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N86-21394 British Library Lending Div., Boston Spa (England).
PROPERTIES OF ION-PLATED TIN FILMS FROM WATCH CASE EXTERIORS
M. Kishi, A. Watanabe, and R. Shimoyama 7 Nov. 1985 13 p Transl. into ENGLISH from Kinzoku Hyomen Gijutsu, v. 35, no. 1, (Japan) 1984 p 50-55
(BLL-Risley-Tr-5110-(9091.9F)) Avail: British Library Lending Division, Boston Spa, Engl.

Ion plating was first proposed in 1963 in the USA and the good cohesion and coverage of the coating attracted much interest. More recently, widespread use has begun to be made of reactive ion-plating, in which the coating is formed while the evaporated material is reacted with an atmospheric gas. Of the various coatings that may be formed by reactive ion-plating, titanium nitride films are now beginning to be widely used for decorative components, chiefly watch case exteriors, on account of their fine gold color coupled with great hardness (Hv greater than 1500). Although, as an alternative to ion plating, titanium nitride coatings can be formed by chemical vapor deposition utilizing titanium halide, this method requires high temperatures (approx. 1000 C) and is unsuitable for decorative applications owing to the coarse grain of the film formed. On the other hand, a variety of ion-plating methods have been devised, examples being active reaction evaporation, the hollow cathode process, and the hot cathode process, and the formation of dense titanium nitride ion-plated films for decorative purposes is described. Author

N86-21395 Cornell Univ., Ithaca, N.Y.
GRAIN BOUNDARY STRUCTURAL TRANSFORMATIONS INDUCED BY SOLUTE SEGREGATION Ph.D. Thesis
Kurt Edward Sickafus 1985 245 p
Avail: Univ. Microfilms Order No. DA8516925

Observations are presented that demonstrate that solute segregation can have a dramatic effect on the structure of a grain boundary. It was determined that the segregation of Au solute to a low-angle, twist boundary in an Fe bicrystal produces a change in the dislocation structure of the boundary. A background to solute segregation effects and an introduction to the theoretical models of grain boundary structure and interfacial segregation are presented. The procedures for the preparation and analysis of the bicrystal specimens are outlined. The experimental results that demonstrate the consequence of solute segregation on boundary are given and the experimental results are discussed. Directions

for future research on interfacial segregation are suggested.
Dissert. Abstr.

N86-21396 Cornell Univ., Ithaca, N.Y.
GRAIN BOUNDARY SLIDING AND RELATED PHENOMENA Ph.D. Thesis
Roupen Leon Keusseyan 1985 250 p
Avail: Univ. Microfilms Order No. DA8516906

At elevated temperatures grain boundary sliding is an important deformation mechanism, leading to grain boundary anelasticity, plastic deformation and stress concentration at inhomogeneities such as grain boundary corners, steps and second phase particles. For grain boundary anelasticity and plastic deformation involving grain boundary sliding a unified state variable model has been proposed. A combination of constant displacement rate tests and load relaxation tests are used to determine the material parameters and flow equations required. A parameter Y, related to the stress concentration at inhomogeneities during grain boundary sliding, was found to be insensitive to the stress level applied and grain size. A non-linear flow equation for the grain boundary was found. The applicability of the model is shown by computer simulation of the experimental results. Dissert. Abstr.

N86-21397 British Library Lending Div., Boston Spa (England).
ENERGY OF PARTICLE INTERACTIONS IN LIQUID MELTS CONTAINING DIFFERENT LATTICE-FORMING IONS
B. M. Lepinskikh, S. P. Kurlov, and O. I. Bukhtoyarov [1985] 8 p refs Transl. into ENGLISH from Izvestiya VUZ Chernaya Metallurgiya (USSR), no. 6, 1985 p 5-8
(BLLD-M-36540-Trans-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

To analyze the influence of bonding energy, repulsion energy, and ionization potentials on the energy of atomization, an examination is made of features of the structure of the atoms that are the basis of formation of elementary structural anion groups in polymerized oxide systems. An analysis is made of variation in the energy situation in a system containing different lattice forming oxides during the formation of chains and rings containing a large number of elementary groups. Author

N86-21398* Cryomagnetics, Inc., Oak Ridge, Tenn.
SUPERCONDUCTING MAGNET Final Report
[1985] 11 p
(Contract NAS5-28627)
(NASA-CR-177848; NAS 1.26:177848) Avail: NTIS HC A02 CSCL 20L

Extensive computer based engineering design effort resulted in optimization of a superconducting magnet design with an average bulk current density of approximately 12KA/cm(2). Twisted, stranded 0.0045 inch diameter NbTi superconductor in a copper matrix was selected. Winding the coil from this bundle facilitated uniform winding of the small diameter wire. Test coils were wound using a first lot of the wire. The actual packing density was measured from these. Interwinding voltage break down tests on the test coils indicated the need for adjustment of the wire insulation on the lot of wire subsequently ordered for construction of the delivered superconducting magnet. Using the actual packing densities from the test coils, a final magnet design, with the required enhancement and field profile, was generated. All mechanical and thermal design parameters were then also fixed. The superconducting magnet was then fabricated and tested. The first test was made with the magnet immersed in liquid helium at 4.2K. The second test was conducted at 2K in vacuum. In the latter test, the magnet was conduction cooled from the mounting flange end. Author

N86-21399 Department of the Air Force, Washington, D.C.
CONDUCTOR STRUCTURE FOR THICK FILM ELECTRICAL DEVICE Patent
Michael D. Adamo, Cederick U. Darter, and Frederick Y. Cho, inventors (to Air Force) Issued 8 Oct. 1985 7 p Supersedes AD-D011240
(AD-D011961; US-Patent-4,546,283; US-Patent-Appl-SN-607094; US-Patent-Class-310-313R) Avail: US Patent and Trademark Office CSCL 20/12

A thick film device conductor arrangement suitable for making connections between a resiliently mounted element such as a surface acoustic delay line and adjacent thick film conductors and then with the device connecting pins. The thick film conductors include a double layer structure of differing noble metals each selected for desirable properties in designated areas of the device. GRA

N86-21400 Department of the Air Force, Washington, D.C.
LPE (LIQUID PHASE EPITAXY) SEMICONDUCTOR MATERIAL TRANSFER METHOD Patent
Frank Z. Hawrylo, inventor (to Air Force) Issued 15 Oct. 1985 5 p Supersedes AD-D011250
(AD-D011963; US-Patent-4,547,230; US-Patent-Appl-SN-635393; US-Patent-Class-148-171) Avail: US Patent and Trademark Office CSCL 20/12

This is a patent for a method for liquid phase epitaxy maskless deposition of a III-V compound on a substrate in a predetermined pattern which includes the steps of contacting a growth wafer having a patterned mask there on to a growth solution in equilibrium and then increasing the temperature of the growth solution and wafer thereby locally melting the exposed portions of the wafer surface and locally changing the equilibrium properties of the growth solution. The substrate upon which the material is to be deposited is then contacted with the growth solution and the temperature lowered. Because of the locally varying equilibrium conditions the constituents of the growth solution will be preferentially deposited on those portions of the portions of the substrate corresponding to the unmasked portions of the growth wafer. GRA

N86-21401*# National Aeronautics and Space Administration. Pasadena Office, Calif.
METHOD OF PRODUCING HIGH T SUPERCONDUCTING NbN FILMS Patent Application
Sarita Thakoor (JPL, Pasadena, Calif.), James L. Lamb (JPL, Pasadena, Calif.), Anilkumar P. Thakoor (JPL, Pasadena, Calif.), and Satish K. Khanna, inventors (to NASA) (JPL, Pasadena, Calif.) Filed 12 Aug. 1985 28 p
(Contract NAS7-918)
(NASA-Case-NPO-16681-1-CU; NAS 1.71:NPO-16681-1-CU; US-Patent-Appl-SN-764812) Avail: NTIS HC A03/MF A01 CSCL 20L

Thin films of niobium nitride with high superconducting temperature (T sub c) of 15.7 K are deposited on substrates held at room temperature (approx. 90 C) by heat sink throughout the sputtering process. Films deposited at P sub Ar $>$ 12.9 + or - 0.2 mTorr exhibit higher T sub c with increasing P sub N2, I' with the highest T sub c achieved at P sub n2, I = 3.7 + or - 0.2 mTorr and total sputtering pressure P sub tot = 16.6 + or - 0.4. Further increase of N2 injection starts decreasing T sub c. NASA

N86-21402*# Stanford Univ., Calif. Dept. of Applied Physics.
GROWTH AND EVALUATION OF AgGaS2 AND AgGaSe2 FOR INFRARED NONLINEAR APPLICATIONS Final Technical Report, 1 Feb. 1982 - 31 Dec. 1985
Robert L. Byer and Robert S. Feigelson Feb. 1986 30 p refs Sponsored in cooperation with NSF, ARO, SRI International, and Quanta-Ray, Inc.
(Grant NAG5-220)
(NASA-CR-176597; NAS 1.26:176597; SU-GL-3994) Avail: NTIS HC A03/MF A01 CSCL 20L

Significant advances were made in the growth technology of silver thiogallate (AgGaS2) and silver selenogallate (AgGaSe2). High efficiency harmonic generation of carbon dioxide laser radiation and tunable infrared parametric oscillation were demonstrated using these materials. Nonlinear frequency conversion in the infrared was limited by the optical properties and the size of the available nonlinear materials. The development of these materials has reduced some of the limitations and generated wide interest. The continued development and application of AgGaS2 and AgGaSe2 now appears assured. Author

N86-21403# Cornell Univ., Ithaca, N.Y.
THE STRUCTURE OF DEFECTS IN GaAs AND RELATED MATERIALS Final Report, 1 Jul. 1982 - 30 Jun. 1985
C. B. Carter 24 Aug. 1985 14 p
(Contract DAAG29-82-K-0148)
(AD-A161272; ARO-18729.6-MS) Avail: NTIS HC A02/MF A01 CSCL 20/12

A new approach for characterizing super-lattice structures has been developed which uses REM to examine the layer quality rather then conventional TEM. The technique developed by Alexander to deform Si at low temperatures has been applied for the first time to GaAs. The results are complimentary to those of Maeda and Takeuchi, but are of a much higher spatial resolution. This technique has been extended to the technologically important case of the superlattice by actually deforming a series of superlattice structures at these same low (150 C) temperatures. Finally a new approach has been developed for growing bicrystals of GaAs using a Ge bicrystal as a substrate. GRA

N86-21404# Westinghouse Research and Development Center, Pittsburgh, Pa.
PLASMA DEPOSITION OF SILICON CARBIDE THIN FILMS Annual Technical Report, 1 Jul. 1984 - 30 Jun. 1985
W. D. Partlow, W. J. Choyke, John T. Yates, Jr., L. E. Kline, and M. J. Bozack 30 Jul. 1985 20 p
(Contract F49620-84-C-0063)
(AD-A161275; AFOSR-85-0969TR; ATR-1) Avail: NTIS HC A02/MF A01 CSCL 20/12

During this reporting period we completed the adaptation of experimental equipment required for three related areas of the research program: understanding plasma deposition chemistry and physics, characterization of plasma deposited thin films, and surface chemistry of elemental deposition processes. In the plasma studies area, extensive experiments were conducted on methane plasmas, and experiments were begun on methane-silane plasmas. We achieved significant anisotropy in the deposition chemistry by controlling electrode bias and the data are being compared to a theoretical model produced in a collaborative effort by L.E. Kline at Westinghouse R&D Center. We have selected characterization techniques for the thin films produced with these plasmas, and measurements have begun. The UHV apparatus for surface chemistry was acquired, assembled, and tested, and initial measurements of the desorption of organic gases were completed. GRA

N86-21405# Lawrence Livermore National Lab., Calif.
TIBER WINDING PACK DESIGN
J. R. Miller 19 Aug. 1985 26 p
(Contract W-7405-eng-48)
(DE85-017879; UCID-20510) Avail: NTIS HC A03/MF A01

A preliminary winding pack design was performed with the goal of showing feasibility of producing 10-T maximum field with a pack current density of 40 sq mm while accepting 2.7 kW per coil nuclear heating. A cable-in-conduit conductor design (CIC), reported at the 6th Topical Meeting on the Technology of Fusion Energy, was based on several key issues. DOE

N86-21406# Oregon Univ., Eugene. Dept. of Physics.
INVESTIGATIONS OF THE ORIGINS OF METASTABLE LIGHT-INDUCED CHANGES IN HYDROGENATED AMORPHOUS SILICON
J. D. Cohen Aug. 1985 43 p
(Contract DE-AC02-83CH-10093)
(DE85-016855; SERI/STR-212-2754) Avail: NTIS HC A03/MF A01

The effects of light saturation on the properties of undoped a-Si:H films were studied by a new capacitance profiling technique that can be used to determine changes directly in the dangling bond density of states near mid-gap. The advantages of this technique are that it is insensitive to changes in near interface and surface states in the a-Si:H samples, that it gives the spatial variation of sample properties, and that it is much more easily interpreted than other profiling techniques. Electron spin resonance spectroscopy was used to seek increases in the number of dangling bond spins, but with negative results. This was determined to be caused by the low defect densities in these samples. The studies revealed two important aspects of the Staebler-Wronski effect in these samples: (1) Results for some films indicated that changes in the dangling bond density could not account for the Fermi level shifts observed: in at least one film, this was the dominant mechanism. (2) Two of the a-Si:H films appeared to be much more stable against light-induced effects than the others. DOE

N86-21407# Los Alamos National Lab., N. Mex.
APPLICATION OF IMPEDANCE SPECTROSCOPY TO PROBLEMS IN SOLID STATE IONICS
I. D. Raistrick 1985 11 p Presented at the 5th International Conference on Solid-State Ionics, Lake Tahoe, Calif., 18 Aug. 1985
(Contract W-7405-eng-36)
(DE85-017544; LA-UR-85-2960; CONF-850870-2) Avail: NTIS HC A02/MF A01

Some applications of impedance spectroscopy to solid state ionics are reviewed. Particular emphasis is given to the effect of statistical distributions of bulk properties on the observed impedance, and to sources of anomalous frequency dispersion in bulk and interfacial response. DOE

N86-21408# Lawrence Livermore National Lab., Calif.
TERNARY FLUORIDES OF GALLIUM AND STRONTIUM
P. Julien and J. Chassaing 30 Jul. 1985 5 p refs Translation of C.R. Acad. Sc. Paris, Volume 271 (15 July 1970)
(Contract W-7405-eng-48)
(DE85-017109; UCRL-Trans-12071) Avail: NTIS HC A02/MF A01

The liquid-solid equilibrium diagram for the GaF3-SrF2 system indicates two tetragonal, iso-type compounds: SrGaF5: a = 14.32 A, c = 7.28 A, with 16 molecules per unit cell, with congruent melting, F 812(0)C, and Sr5Ga3F19: a = 14.22 A, c = 7.27 A with 4 molecules per unit cell. SrCaF5 forms a continuous solid solution with PbGaF5, the same as Sr5Ga3G19 with Pb3(GaF6)2. DOE

N86-21409# Argonne National Lab., Ill.
EXOTIC ORGANIC SUPERCONDUCTORS BASED ON BEDT-TTF AND THE PROSPECTS OF RAISING T/SUB C/'S
J. M. Williams, M. A. Beno, H. H. Wang, U. W. Geiser, T. J. Emge, P. C.W. Leung, G. W. Crabtree, K. D. Carlson, L. J. Azevedo, and E. L. Venturini 1985 17 p refs Presented at the International Conference on Neutron Scattering, Santa Fe, N. Mex., 19 Aug. 1985 Prepared in cooperation with Sandia National Labs., Albuquerque, N. Mex. and North Carolina State Univ., Raleigh
(Contract W-31-109-eng-38)
(DE85-018407; CONF-850871-13) Avail: NTIS HC A02/MF A01

Ambient-pressure superconductivity has now been discovered in five systems based on BEDT-TTF:X, X(-) = polyatomic monovalent-anion. The highest T/sub c/ reported is 5 K, in (BEDT-TTF) 2AuI2, and it appears that much higher T/sub c/'s are possible if disorder (molecular and anionic), and structural modulation, can be avoided in new derivatives containing monovalent triatomic anions. DOE

N86-21410# Argonne National Lab., Ill.
MEDIUM VOLTAGE ANALYTICAL ELECTRON MICROSCOPY MICROANALYSIS VERSUS RADIATION DAMAGE
N. J. Zaluzec, J. F. Mansfield, P. R. Okamoto, and N. Q. Lam Sep. 1985 5 p Presented at the Electron Microscopy and Analysis Group Conference, Newcastle-Upon-Tyne, England, 2 Sep. 1985
(Contract W-31-109-eng-38)
(DE85-018463; CONF-8509168-1) Avail: NTIS HC A02/MF A01

The kinetic energy transferred to some elements by an electron of kinetic energy 100 to 400 kV is discussed. The displacement rates are compared to the signal generation. DOE

N86-21411# Brookhaven National Lab., Upton, N. Y.
CRITICAL CURRENT STUDIES ON FINE FILAMENTARY NbTi

ACCELERATOR WIRES

M. Garber, M. Suenaga, W. B. Sampson, and R. L. Sabatini 1985 8 p Presented at the Cryogenic Engineering Conference and International Cryogenic Materials Conference, Boston, Mass., 12 Aug. 1985

(Contract DE-AC02-76CH-00016)
(DE86-000032; BNL-37019; CONF-850814-22) Avail: NTIS HC A02/MF A01

The magnets for the Superconductig Super Collider, a high energy proton colliding beam accelerator, require a superconductor with very high current density (> 2400 A/mm(2) at 5 T) and very small filaments (approx. 2(MU)m in diameter). Previous work has shown that by controlling the formation of Cu4Ti compound particles on the filament surfaces, it is possible to make fine filamentary NbTi wire with high critical current density. The performance of multi-filamentary wire is characterized by the current density and the quantity n which describes the superconducting-normal transition. Micrographs of wires having high J sub c and high n show smooth, uniform filaments. Recently wires of very high critical current and high n have been produced in experimental quantities by commercial manufactures. DOE

N86-21412# California Univ., Berkeley. Lawrence Berkeley Lab.

CAPACITOR ENERGY NEEDED TO INDUCE TRANSITIONS FROM THE SUPERCONDUCTING TO THE NORMAL STATE

P. H. Eberhard and R. R. Ross Aug. 1985 28 p Presented at the 9th International Conference on Magnet Technology, Zurich, Switzerland, 9 Sep. 1985

(Contract DE-AC03-76SF-00098)
(DE86-000604; LBL-20054; CONF-850920-3) Avail: NTIS HC A03/MF A01

A technique is described to turn a long length of superconducting wire normal by dumping a charged capacitor into it and justify some formulae needed in the design. The physical phenomenon is described. A formula for the energy to be stored in the capacitor is given. There are circumstances where the dc in an electrical circuit containing superconducting elements has to be turned off quickly and where the most convenient way to switch the current off is to turn a large portion or all of the superconducting wire normal. Such was the case of the Time Projection Chamber (TPC) superconducting magnet as soon as a quench was detected. The technique used was the discharge of a capacitor into the coil center tap. It turned the magnet winding normal in ten milliseconds or so and provided an adequate quench protection. The technique of discharging a capacitor into a superconducting wire should have many other applications whenever a substantial resistance in a superconducting circuit has to be generated in that kind of time scale. DOE

N86-21413# Brookhaven National Lab., Upton, N. Y.

MAGNETIZATION AND CRITICAL CURRENTS OF NbTi WIRES WITH FINE FILAMENTS

A. K. Ghosh and W. B. Sampson 1985 8 p Presented at the Cryogenic Engineering Conference and International Cryogenic Materials Conference, Boston, Mass., 12 Aug. 1985

(Contract DE-AC02-76CH-00016)
(DE86-001195; BNL-37044; CONF-850814-28) Avail: NTIS HC A02/MF A01

In high energy accelerators such as the Superconducting Supercollider (SSC), the magnetization of the superconductor is an important component in determining the harmonic fields at injection (approx.0.3T). In an effort to reduce these residual fields, interest has focused on NbTi conductors with fine filaments which are expected to have a reduced magnetization as dictated by the critical state model. With this in view, the magnetization and critical currents were measured at 4.3K for a set of NbTi wires with filament diameters, d, ranging from 1.0 to 5.0 microns. The data show that, although the magnetization scales linearly with d, it does not do so with the product J sub c d for d less than 3 mu m. However, at these d values, the critical transport current density, J sub c of NbTi was observed to decrease rapidly as a function of d. The origin of this J sub c degradation and its effect on the scaling of magnetization within the framework of the critical state model is explored. We also examine the question of the observed asymmetry of the hysteretic magnetization. DOE

N86-21414# Brookhaven National Lab., Upton, N. Y.

SYMMETRY, STABILITY, AND DIFFRACTION PROPERTIES OF ICOSAHEDRAL CRYSTALS

P. Bak 1985 12 p Presented at the International Conference on Neutron Scattering, Santa Fe, N. Mex., 19 Aug. 1985

(Contract DE-AC02-76CH-00016)
(DE86-001196; BNL-37043; CONF-850871-19) Avail: NTIS HC A02/MF A01

In a remarkable experiment on an Mn-Al alloy, Shechtman, et al., observed a diffraction spectrum with icosahedral symmetry. This is inconsistent with discrete translational invariance since the symmetry includes a five-fold axis. In this paper, it is shown that the crystallography and diffraction pattern can be described by a six-dimensional space group. The crystal structure in 3d is obtained as a cut along a 3d hyperplane in a regular 6d crystal. Displacements of the 6d crystal along 6 orthogonal directions define 6 continuous symmetries for the icosahedral crystal, three of which are phase symmetries describing internal rearrangements of the atoms. DOE

N86-21415# Technische Hogeschool, Delft (Netherlands). Lab. voor Technische Natuurkunde.

TEST OF A BaF2 SCINTILLATION CRYSTAL [TEST VAN EEN BAF2 SCINTILLATIEKRISTAL]

J. M. Schippers and J. deVries Apr. 1983 15 p ref In DUTCH (Stratech-83-2) Avail: NTIS HC A02/MF A01

Gamma energy response and temporal resolution of a BaF2 crystal were compared with those of a Pilot-U plastic. Using a photomultiplier, the possibility to use the fast ultraviolet component of the gamma ray excited emission spectrum for positron lifetime measurements was investigated. For the gamma energy response, the BaF2 crystal (height 2.5 cm, diameter 2.5 cm) was coupled to the multiplier with and without an optical coupling compound. In an existing spectrometer, temporal resolution of Pilot-U detectors with 0.5 and 2.5 cm thickness and the BaF2 crystal was measured. As positron emitters, NA22, Co60, Cs137, Am241, Co57, and Bi2O7 were used. To obtain a temporal resolution comparable to the 0.5 Pilot-U plastic, a 1 mm thick crystal should be used. An improvement is obtained by omitting the (ultraviolet absorbing) coupling compound. For tomographic time of flight purposes, the use of positron emitters with a maximum gamma energy of 300 keV is recommended. Author (ESA)

N86-21416# Groningen Rijksuniversiteit (Netherlands). Solid State Physics Lab.

ELECTRICAL RESISTIVITY AND THERMOPOWER OF LIQUID ALKALI-ALKALI AND Li-Mg ALLOYS

J. Hennephof, P. D. Feitsma, C. vanderMarel, W. vanderLugt, A. B. vanOosten, comp., and W. vanderLugt, comp. 3 Dec. 1985 15 p

Avail: NTIS HC A02/MF A01

Resistivity (r) and thermopower (S) measurements on liquid alkali-based alloys are given as a function of concentration and temperature. Tables of r are given for the systems Li-Na, Li-Mg, Na-K, Na-Rb, Na-Cs, K-Rb, K-Cs, Rb-Cs. A table of S is given for Na-Cs. The experimental error in r does not exceed 1% except for the case of pure liquid Cs, where the values differ by 3,5%. The error in the S-values does not exceed 0.2 mV/deg K. Author (ESA)

N86-21417# Groningen Rijksuniversiteit (Netherlands). Solid States Lab.

ELECTRICAL RESISTIVITY OF SOME COMPOUND FORMING LIQUID METAL ALLOYS (Li-Pb, Na-Pb, K-Pb, Rb-Pb, Cs-Pb, Li-Sn, Na-Sn, Na-In, K-In)

C. vanderMarel, A. B. vanOosten, J. A. Meijer, G. J. B. Vinke, and W. vanderLugt 3 Dec. 1985 25 p refs

Avail: NTIS HC A02/MF A01

Electrical resistivity data for the alloy systems Li-Pb, Na-Pb, K-Pb, Rb-Pb, Cs-Pb, Li-Sn, Na-Sn, Na-In and K-In are shown in

graphs and tables. The relative error in the resistivity (r) is roughly proportional to r. For resistivities up to 1000 micro-ohm cm it does not exceed 1%. In the Rb-Pb and Cs-Pb systems, an error of 2.5% must be reckoned with in the region around the resistivity maximum. Author (ESA)

N86-21418# Netherlands Energy Research Foundation, Petten.
PHASE TRANSITIONS IN THE MIXED QUADRATIC-LAYER ANTIFERROMAGNETS WITH COMPETING ANISOTROPIES K2Co(x)Fe(1-x)F4 Thesis - Utrecht Univ.
W. A. H. M. Vlak Sep. 1985 114 p refs
(ECN-169; B8573795) Avail: NTIS HC A06/MF A01

The magnetic phases of the randomly mixed two-dimensional antiferromagnet K2 Co(x)Fe(1-x)F4 were explored. Ordered phases similar to those in K2FeF4 and K2CoF4 are detected for low and high x, respectively. By virtue of the competition between the orthogonal anisotropies of the Fe(2+) and Co(2+) ions, a third ordered oblique phase is found for 0.20 < or = x < or = 0.32, in which all moments are oriented in between the preferential axes of Fe(2+) and Co2+. The critical behavior, sublattice magnetization and magnetization of individual ions, and magnetic excitations, for compositions and temperatures covering all relevant parts of the phase diagram were studied. The magnetic structure of a system which enters the oblique phase was investigated in an external magnetic field. Strong nonequilibrium behavior related to random-field effects is observed. Author (ESA)

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

No abstracts in this category.

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N86-21419*# American Productivity Center, Houston, Tex.
WHITE COLLAR PRODUCTIVITY IMPROVEMENT: SPONSORED ACTION RESEARCH 1983 - 1985
1985 41 p Presented at the National Conference on White Collar Productivity Improvement, Dallas, 30-31 Oct. 1985; sponsored by Dun and Bradstreet Corp., General Dynamics Corp., McDonnell Douglas Corp., Northern Telecom Ltd., Westinghouse Furniture Systems, and the US Dept. of Labor Sponsored in part by Armco., Inc., Atlantic Richfield Co., Johnson and JohnsonMotorola, Inc., Ortho Pharmaceutical Corp., Rockwell International Corp., TRW, Inc., and Warner-Lambert Co.
(Contract NASw-3834)
(NASA-CR-176366; NAS 1.26:176366) Avail: NTIS HC A03/MF A01 CSCL 05A

A program developed by the American Productivity Center to boost white collar worker effectiveness is described. This program is the culmination of a two-year sponsored action research project, White Collar Productivity Improvement. Traditional attempts aimed at cutting costs or staffing levels, often alienating workers at the outset. They typically focused on increased efficiencies in individual activities or specific procedures, such as paperwork processing. In contrast, the Center's approach to white collar productivity focuses on the effectiveness of actual outputs, typically professional services. These typically consist of both tangible products, such as a financial report or research study, and intangibles, such as the expertise, advice or guidance that accompanies the product. Eight general observations about white collar productivity improvement are summarized. B.W.

N86-21420*# National Aeronautics and Space Administration, Washington, D.C.
NASA: 1986 LONG-RANGE PROGRAM PLAN
Aug. 1985 269 p
(NASA-TM-87560; NAS 1.15:87560) Avail: NTIS HC A12/MF A01 CSCL 05A

For the years beyond FY 1986, the plan consists of activities that are technologically possible and considered to be in the national interest. Its implementation will ensure logical and continued progress in reaching the Nation's goals in aeronautics and space, consistent with the responsibilities assigned NASA by the National Aeronautics and Space Act of 1958, as amended. The major features of the programs are described in detail and the nature of the aeronautics and space programs beyond the year 2000 are projected. The abbreviations and acronyms that appear in this report are listed. The status of NASA's plans are summarized at the time of its preparation. Author

N86-21421# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
PARTICIPATIVE DECISION MAKING AND QUALITY CIRCLES: A LOOK AT THEIR RELATIONSHIP IN THREE US GOVERNMENT ORGANIZATIONS M.S. Thesis
James B. Minchello Sep. 1985 85 p
(AD-A161360; AFIT/GLM/LSB/85S-52) Avail: NTIS HC A05/MF A01 CSCL 05/1

The use of Quality Circles (QCs) as an organizational development intervention, has gained increasing popularity over the past few years in the federal sector. Much of the recent attention concerning QCs has been centered around understanding the organizational and attitudinal variables inherent in the QC process. It is theorized that by understanding these variables, researchers are better able to evaluate the effectiveness of QC interventions. This thesis effort sets out to determine the relationship between one particular attitudinal variable, Paticipative Decision Making (PDM) and the intervention of QCs. QC programs in organizations within the federal sector were studied utilizing a nonequivalent control group design. Statistical tests used to facilitate evaluation of the data included the independent mean and paired difference t-tests and Cronbach's Alpha Reliability Coefficient technique. The evaluation of the data produced mixed results dealing with the relationship between PDM and QCs. A better understanding of the QC process and its effects on organizational and attitudinal variables is needed and evidenced by the shortage of research in these areas. By understanding the QC intervention, researchers will be better able to assess its effectiveness. GRA

N86-21422# Assistant Secretary of Defense (Installations and Logistics), Washington, D.C.
TRANSITION FROM DEVELOPMENT TO PRODUCTION
Sep. 1985 169 p
(AD-A161804; AD-E440305) Avail: NTIS HC A08/MF A01 CSCL 15/5

This manual provides assistance in structuring technically sound programs, assessing their risk, and identifying areas needing corrective action. It applies to the Office of the Secretary of Defense (OSD), the Military Departments, the Organization of the Joint Chiefs of Staff, and the Defense Agencies. The major thrust of the DSB report is directed toward the identification and establishment of critical engineering processes and their control methods.

This will lead to a more organized accomplishment of these activities and will place more significance and accountability on them. Selected areas of this document stress the electrical and electronics field is playing in improving system effectiveness and productivity. GRA

N86-21423# Puerto Rico Univ., San Juan.
DEVELOPMENT PLAN: CENTER FOR ENERGY AND ENVIRONMENT RESEARCH, UNIVERSITY OF PUERTO RICO
May 1985 48 p
(DE86-000061; CEER-X-208) Avail: NTIS HC A03/MF A01

This document delineates the development plan for the Center for Energy and Environment Research (CEER) within the framework of the 1983 UPR Master Plan. The development plan, using the CEER mission as its point of departure, provides for the allocation of available human, technical and financial resources needed to achieve its mission and sets programmatic goals and priorities on short, intermediate and long terms. It also considers the overall and general budgetary requirements and identifies major funding sources. Since UPR funding support and the potential for competitive fund raising is limited, the plan stresses a program of high quality research within the context of service to Puerto Rico for problem oriented energy and environment research and development activities and leadership for education and technology transfer in the Caribbean Basin. DOE

N86-21424# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
NETHERLANDS AND SPACE FLIGHT. ELUCIDATION PRESENTED AT THE SPACE FLIGHT AND INNOVATION INFORMATION DAY [NEDERLAND EN DE RUIMTEVAART. TOELICHTING GEGEVEN OP DE INFORMATIEDAG RUIMTEVAART EN INNOVATIE IN HET MICROCENTRUM TE EINDHOVEN OP 30 NOVEMBER 1983]
H. Wittenberg Dec. 1983 7 p In DUTCH Conference held at Eindhoven, Netherlands, 30 Nov. 1983
(VTH-M-494) Avail: NTIS HC A02/MF A01

The relatively small participation of the Netherlands in space flight developments is criticized. With regard to industrial innovation, the importance of increased participation in bi or trilateral international cooperation projects is emphasized. It is concluded that space flight activities stimulate technology transfer and the interelated industrial development. Author (ESA)

N86-21425# Netherlands Energy Research Foundation, Petten.
PHASED MISSION ANALYSIS OF MAINTAINED SYSTEMS. A STUDY IN RELIABILITY AND RISK ANALYSIS
K. Terpstra Sep. 1984 351 p refs
(ECN-158; B8478686) Avail: NTIS HC A16/MF A01

A methodology that analyzes phased missions and all branches of an event tree and can take into account repair of the system during its mission and the effects of component models with general distributed lifetimes and repair times was developed. The introduction of the concept of period of a component makes it possible to separate the analysis of the system behavior from that of the component behavior. As a result the calculation of the probability of mission success is very simple. However, calculation of component unavailability becomes intricate, particularly if no negative exponentially distributed lifetimes and repair times are applied. Author (ESA)

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N86-21426 Library of Congress, Washington, D. C.
THE INTERNATIONAL OF SCIENTIFIC AND TECHNICAL INFORMATION. A SUMMARY OF THE 2ND ANNUAL FORUM ON FEDERAL INFORMATION POLICIES
Barbara J. Meredith 1985 28 p Forum held at Washington, D.C., 27 Feb. 1985
Avail: NTIS HC A03/MF A01

Information is part of a generic list of materials whose internal flow the military urges the US to control. The Department of defense's policy is described. The trends causing tightening of scientific communications are examined. The effects of copyright laws on international flow of information are discussed. B.G.

N86-21427*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RESEARCH AND TECHNOLOGY, LEWIS RESEARCH CENTER Annual Report, 1985
1985 57 p
(NASA-TM-87179; NAS 1.15:87179) Avail: NTIS HC A04/MF A01 CSCL 05B

The NASA Lewis Research Center's research and technology accomplishments for fiscal year 1985 are summarized. The report is organized into five major sections covering aeronautics, aerospace technology, spaceflight systems, space station systems, and computational technology support. This organization of the report roughly parallels the organization of the Center into directorates. Where appropriate, subheadings are used to identify special topics under the major headings. Results of all research and technology work performed during the fiscal year are contained in Lewis-published technical reports and presentations prepared either by Lewis scientists and engineers or by contractor personnel. In addition, significant results are presented by university faculty or graduate students in technical sessions and in journals of the technical societies. For the reader who desires more information about a particular subject, the Lewis contact will provide that information or references. In 1985, five Lewis products were selected by Research and Development Magazine for IR-100 awards. All are described and identified. In addition, the Lewis Distinguished Paper for 1984 to 1985, which was selected by the Chief Scientist and a research advisory board, is included and so identified. Author

N86-21428*# Research and Data Systems, Inc., Lanham, Md.
USER'S GUIDE AND TAPE SPECIFICATION FOR ERB 7 DELMAT
Philip Ardanuy and Lanning Penn Mar. 1985 46 p refs
(Contract NAS5-27728)
(NASA-CR-175299; NAS 1.26:175299) Avail: NTIS HC A03/MF A01 CSCL 05B

Guidance is provided to the DELMAT user in the areas of purpose, use and limitations of DELMAT tapes and software. The DELMAT tape specifications is also provided. The ERB-7, ERB MAT and tape characteristics applicable to the DELMAT tapes are also summarized. Author

N86-21429# Defense Technical Information Center, Alexandria, Va.
AN ANALYSIS OF PROPOSED ALTERNATIVES TO THE DEFENSE TECHNICAL INFORMATION CENTER'S ANNOUNCEMENT PRODUCTS AND SERVICES Final Report
B. Lesser, M. Hanna, and R. Evans Oct. 1985 69 p
(AD-A160365; DTIC/TR-85/13) Avail: NTIS HC A04/MF A01 CSCL 05/2

Currently, the Defense Technical Information Center (DTIC) offers it users information about new reports entered into the DTIC database through: the Defense RDT&E Online System (DROLS), the Current Awareness Bibliography (CAB) service and the Technical Abstract Bulletin (TAB). However, the decrease in the number of TAB subscribers, the decreasing usefulness of TAB and its unavailability to many DTIC users are matters of grave concern and force DTIC to look at possible replacements for TAB. In the future, when the vast majority of DTIC users have their own terminals, the need for paper-based announcement products may be eliminated. However, until that time, DTIC must continue to produce print products. Therefore, the authors recommend that

the following actions be taken: (1) DTIC should discontinue the publication of TAB; and (2) DTIC should publish and unclassified, limited, monthly, comprehensive acquisitions list with indexes. The citations in the list would not contain abstracts or subject terms. A subject list would not be offered. Author (GRA)

N86-21430# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
AGARD BULLETIN TECHNICAL PROGRAMME 1986
Aug. 1985 41 p
(AD-A161553; AGARD-BUL-85/2) Avail: NTIS HC A03/MF A01 CSCL 05/1

This Bulletin presents the 1986 program approved by the AGARD National Delegates Board. Section 1 includes a chronological listing of the meetings tentatively scheduled to take place during 1986 and Section 2 gives a detailed description of the individual Panel Program, the Consultant and Exchange Program, and the Military Committee Studies Program. The total budget required to support the Proposed 1986 AGARD Technical Program is presented in Section 3. The Publication Summary in Section 4 identifies by activity the AGARD publications scheduled for publication in 1986. GRA

N86-21431# Defense Technical Information Center, Alexandria, Va.
THE INTEGRATED BIBLIOGRAPHIC INFORMATION SYSTEM: RESOURCE SHARING TAILORED FOR LOCAL NEEDS Final Report
Gladys A. Cotter and Richard W. Hartt Nov. 1985 11 p Presented at the International Online Meeting, London, England
(AD-A161700; DTIC/TR-85/17) Avail: NTIS HC A02/MF A01 CSCL 05/2

The Defense Technical Information Center (DTIC) is charged with providing information services to the scientific and technical community of the Department of Defense (DOD). These service range from collecting and disseminating bibliographic information to sponsoring and directing research into innovative information handling technologies. Through this research, DTIC actively seeks ways to promote resource sharing as a means for speeding access to information while reducing the costs of information processing throughout the Defense technical library community. As part of this research, DTIC is sponsoring the development of an Integrated Bibliographic Information System (IBIS). The prototype of this system has been under development since April 1983. It will be used to demonstrate and evaluate the advantages of combining an integrated library system with an intelligent gateway capable of querying and updatng -- simultaneously -- heterogeneous bibliographic databases. Queries and updates of databases will be performed using a common command language, relieving the system user of the need to master separate languages and procedures for each database accessed. Users will be able to download and post-process data from external sources. This capability will allow libraries to tailor search results, derived from external sources and a local catalog, to their patron's needs and deliver a single product in an economical and efficient manner. GRA

N86-21432# Defense Technical Information Center, Alexandria, Va.
THE DOD GATEWAY INFORMATION SYSTEM Final Report
Gladys A. Cotter Oct. 1985 10 p Presented at the IEEE Conference, Williamsburg, Va.
(AD-A161701; DTIC/TR-85/16) Avail: NTIS HC A02/MF A01 CSCL 05/2

The Defense Technical Information Center (DTIC) is sponsoring development of a DOD Gateway Information System (DGIS) to provide online, streamlined methods for identifying, accessing, searching and analyzing data from heterogenous databases of interest to the DOD community. Present-day access to information resources (data-bases) is limited since each database has its own complex access procedure and command language. In addition, results from multiple databases cannot be combined or analyzed easily by the user. The Gateway will provide DOD researchers and managers access to many different databases using a single, simple access procedure. Queries of databases will be performed using a common command language, relieving the system user of the need to learn and master separate languages and procedures for each database accessed. A prototype system is under development at the Lawrence Livermore National Laboratory. The characteristics required in the DGIS and the development approach for designing a prototype system are described. GRA

N86-21433# Instituut TNO voor Wiskunde, Informatieverwerking en Statistiek, The Hague (Netherlands).
NONGRAMMATICAL LANGUAGE PROCESSING
J. Chudacek Apr. 1984 17 p refs Submitted for publication
(IWIS-A-84-AU-28) Avail: NTIS HC A02/MF A01

An approach to natural language processing based on nongrammatical entities is discussed. The Principle of Least Effort and properties of n-grams (overlapping character-strings of length n) are considered. Systems for retrieval in free natural languages are described. The systems behave tolerantly towards the inexactness of natural languages and the people using them. They are suitable for integrating with other systems. Author (ESA)

N86-21434# National Technical Information Service, Springfield, Va.
INFORMATION FOR THE DEVELOPING WORLD: NTIS'S (NATIONAL TECHNICAL INFORMATION SERVICES'S) ROLE IN INFORMATION TRANSFER TO DEVELOPING COUNTRIES
J. F. Caponio 1985 17 p Presented at the International Federation of Library Association Conference, Chicago, Ill., 1985
(PB85-243269) Avail: NTIS HC A02/MF A01 CSCL 05B

There is a great need for technical information in developing countries. Technical information is broadly defined to include all knowledge relating to how any specific economic activity is carried out. The techniques used by the National Technical Information Service (NTIS) of the U.S. Department of Commerce in helping both individuals and institutions (ranging from small shopkeepers to technical institutes) in developing countries to solve their technical information needs by providing access to NTIS's vast collection of reports and documents are described. The need for technical information in developing countries are outlined, then the techniques and mechanisms being used in the transfer of technical information described and finally, the findings of a recent study illustrating how data from NTIS documents is being applied to address a wide range of technical problems in developing countries are described. The competent local implementing institutions, are vital links the chain of international information dissemination. GRA

N86-21435# National Bureau of Standards, Washington, D.C. Information Resources and Services Div.
PUBLICATIONS OF THE NATIONAL BUREAU OF STANDARDS, 1984 CATALOG Report, Jan. - Dec. 1984
R. J. Morehouse Jun. 1985 441 p
(PB85-245678; NBS/SP-305-SUPPL-16) Avail: NTIS HC A19/MF A01; SOD HC $16.00 as 003-003-02667-1 CSCL 05B

The 16th Supplement to Special Publication 305 lists the 1984 papers which reflect the results of National Bureau of Standards (NBS) programs. Also included are those NBS papers published prior top 1984 but not reported in previous supplements of SP305. In addition to bibliographic data, key words, and abstracts for each publication and/or paper, the catalog provides author, key word, title, and NTIS order/report number indexes. GRA

N86-21436# National Library of Medicine, Bethesda, Md.
MEDICAL SUBJECT HEADINGS, TREE STRUCTURES, 1986
Jul. 1985 466 p
(PB85-232635; NLM/MED-85/03) Avail: NTIS HC A20/MF A01 CSCL 05B

All Medical Subject Headings currently in use by the National Library of Medicine's indexers, catalogers, and searchers are arranged in a hierarchical manner showing relationships between

broader and narrower terms. Included are minor and geographic descriptors. GRA

N86-21437# National Library of Medicine, Bethesda, Md.
PERMUTED MEDICAL SUBJECT HEADINGS, 1986
Jul. 1985 596 p
(PB85-232643; NLM/MED-85/04) Avail: NTIS HC A25/MF A01 CSCL 05B

Permuted Medical Subject Headings, 1986, is a computer generated display of all terms, i.e., descriptors and cross references, in the alphabetic list of the National Library of Medicine's Medical Subject Headings (MeSH) for 1986, as well as all citation type, check tag, and geographic descriptors in the Annotated Alphabetic MeSH, 1986. The Permuted MeSH takes each significant word that appears in each MeSH term and then lists all the MeSH terms in which that word appears. GRA

N86-21438# Online Computer Systems, Inc., Germantown, Md.
INTEGRATED LIBRARY SYSTEM USER MANUAL FOR FINES AND BILLING SUBSYSTEMS
Dec. 1984 54 p
(PB85-243293; LHNCBC-CR-85-01; NLM/SW/MT-85/001A) Avail: NTIS HC A04/MF A01 CSCL 05B

Enhancements to standard (ILS) which support a fines and billing system in addition to a copy record function for location information, a calendar of closed days for circulation control, and improved functions for detailing circulation policies are presented. GRA

N86-21439# National Environmental Satellite Service, Washington, D. C.
PUBLICATIONS AND FINAL REPORTS ON CONTRACTS AND GRANTS, 1985
N. A. Everson Apr. 1985 19 p
(PB85-208460; NOAA-TM-NESDIS-11) Avail: NTIS HC A02/MF A01 CSCL 05B

The technical memorandum is one of a series containing lists of articles and reports published by or for the National Environmentals Satellite, Data and Information Service (NESDIS). The issue lists items published or received during 1984 and includes items omitted from the previous issue. GRA

N86-21440# Sheffield Univ. (England). Dept. of Information Studies.
EVALUATION OF CLUSTERING METHODS FOR AUTOMATIC DOCUMENT CLASSIFICATION Final Report, Oct. 1982 - Sep. 1984
A. Griffiths and P. Willett Oct. 1984 79 p
(BLRDR-5837) Avail: Issuing Activity

Use of hierarchic agglomerative clustering methods for automatic document classification is discussed. Extensive comparative studies are made of the classifications produced by application of the single linkage, complete linkage, group average and Ward clustering methods to the Keen, Cranfield and Evans document test collections. A range of experiments is described. After validating the use of clustering methods for structuring document collections, studies are presented of the degrees of distortion imposed on the input similarity matrices when the four clustering methods are applied to them, and of the structures of the four types of cluster hierarchy. An extent series of retrieval tests is reported using the cluster based retrieval search strategy, together with a comparison of the membership of the clusters formed by use of the methods. Results suggest that the single linkage method, which was used extensively in document clustering, may not be the most effective procedure, although it should be emphasized that the experiments used only small document test collections. Author

N86-21441# Leicester Univ. (England). Office for Humanities Communication.
BIBLIOGRAPHIC DATABASES ON MICROCOMPUTERS: A SERIES OF DEMONSTRATIONS FOR STAFF AND RESEARCH STUDENTS IN THE HUMANITIES Final Report
J. S. Macdonald Nov. 1984 47 p
(BLRDR-5844) Avail: Issuing Activity

The applications of private data bases on microcomputers were demonstrated. To this end, it was decided to use the Schools Information Retrieval (SIR) software package, not least because of its availability as British Library Research and Development Department (BLRDD) material, but also because of its suitability as a simple bibliographic data base package. The aims and objectives were: (1) to increase awareness of the convenience and utility of distant commercial data bases within the context of research in the humanities; (2) to show the extent to which a private data base on a microcomputer can be used as a more effective research tool than the conventional, manual card indexing and cataloging system; and to assess the reaction to the assumptions of the first two objectives. B.G.

N86-21442# Newcastle-upon-Tyne Univ. (England). School of Librarianship and Information Studies.
CALLISTO: A DIRECTORY OF NEW TECHNOLOGY IN USE IN UK SCHOOLS OF LIBRARY AND INFORMATION STUDIES
Joan M. Day, D. Alasdair Kemp, and Lucy A. Tedd 1985 93 p
(BLRDR-5801) Copyright. Avail: Issuing Activity

The CALLISTO (Computer Assisted Learning in Library and Information Studies Teaching Organizations) Directory is the result of a British Library funded survey of Schools of Librarianship and Information Studies in the United Kingdom, to investigate the extent to which new technology is being used in Courses - SECTION A. In particular, the development of software packages for computer Assisted Learning throughout the curriculum is recorded in SECTION 2 CALLISTO: software bibliography to enable wider use to be made of the programs by the information community in general as well as to support the already high level of co-operation and exchange between Schools. Author

N86-21443# Science Research Council, London (England).
OPTICAL CHARACTER RECOGNITION: THE TECHNOLOGY AND ITS APPLICATION IN INFORMATION UNITS AND LIBRARIES
John W. T. Smith and Zinat Merali (Centre for Information Media and Technology of Great Britain) 1985 136 p refs
(LIRR-33; ISBN-07123-3047-X; ISSN0263-1709) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

This report is intended to be of interest to anyone who is considering optical character recognition (OCR) in an information or library context. Chapter 1 shows where OCR fits in the range of electro-optic for optoelectric devices including facsimile optical mark recognition and OCR. It includes a brief history of OCR and indicates the possible applications of OCR within information work. Survey results of special libraries and information units concerning the use of OCR and the views of OCR by users and nonusers are reported. Four case studies of OCR applications are presented. A survey of available machines considered of possible value in information or library application is presented. It includes full specifications of each machine and explanatory text of those specifications. A simple guide to choosing and OCR machine for a specific purpose is given. Author

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N86-20423# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
PRODUCTIVITY: THE ECONOMIC ASPECTS OF CRYOGENIC WIND TUNNEL DESIGN AND USE
J. Christophe *In* AGARD Special Course on Cryogenic Technology for Wind Tunnel Testing Jul. 1985 21 p refs (For primary document see N86-20415 11-09)
Avail: NTIS HC A18/MF A01

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N86-21444# Congress of the United States, Washington, D.C.
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AUTHORIZATION ACT OF 1986
Washington GPO 5 Dec. 1985 8 p H.R. 1714, enacted into law by the 99th Congress, 5 Dec. 1985
(PUB-LAW-99-170) Avail: US Capitol, House Document Room

The National Aeronautics and Space Administration Authorization Act of 1986 (Public Law 99-170) was enacted on 5 December 1985. The 7.7 billion dollar authorization is broken down as follows: Research and Development - 2.8 billion; Space Flight Control, and Data Communications - 3.4 billion; Construction of Facilities - 140 million; and Research and Program Management -1.4 billion. Section 106 of the Law prohibits the use of a civil space station to carry a nuclear weapon or other weapon of mass destruction. Title II sets pricing policy for the use of the Shuttle's services by commercial and foreign entities. F.M.R.

N86-21445# Committee on Commerce, Science, and Transportation (U. S. Senate).
AUTHORIZATION FOR THE ATMOSPHERIC AND SATELLITE PROGRAMS OF THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
John C. Danforth Washington GPO 1985 9 p Rept. to accompany S. 1103 presented by the Comm. on Commerce, Science, and Transportation, 99th Congr., 1st Sess., 30 May 1985
(S-Rept-99-75; GPO-51-010) Avail: US Capitol, Senate Document Room

The Federal budget allocations for the National Oceanic and Atmospheric Administration (NOAA) are presented. The importance of collection, analysis, and dissemination of weather data by the National Weather Service (NWS) is examined. Procurement, operation, and maintenance of the NOAA Satellite system is described. B.G.

N86-21446# Committee on Science and Technology (U. S. House).
SUBJECTS AND POLICY AREAS FOR THE CONSIDERATION OF THE HOUSE COMMITTEE ON SCIENCE AND TECHNOLOGY, 99TH CONGRESS
Washington GPO 1985 146 p Presented to the Committee on Science and Technology, 99th Congress, 1st Session, Apr. 1985 Prepared by the Library of Congress, Congressional Research Service
(GPO-45-170) Avail: US Capitol, House Document Room

The Committee on Science and Technology of the U.S. House of Representatives (99th Congress) accepted in April 1985 the annual report of the Congressional Research Service of the Library of Congress (dated 4 March 1985) on the subjects and policy areas which CRS feels the Committee might wish to analyze in depth during the current session of Congress, which report was submitted in accordance with the Legislative Reorganization Act of 1970. Among the subjects tendered for the Committee's consideration were food and nutrition, energy policy, the environment, computer science, telecommunications, science and technology abroad, life sciences and biotechnology, strategic and critical materials, space R&D, technology transfer, and weather, climatology and Earth sciences. Basic to the foregoing, Congress is asked to examine recent trends reflecting increased Federal funding for defense as opposed to civilian R&D and the implications for the U.S. economy and its international competitive position. F.M.R.

N86-21447# Committee on Science and Technology (U. S. House).
OVERSIGHT ON THE FEDERAL AVIATION ADMINISTRATION FISCAL YEAR 1986 RESEARCH, ENGINEERING AND DEVELOPMENT BUDGET REQUEST
Washington GPO 1985 191 p Hearings before the Subcommittee on Transportation, Aviation and Materials of the Committee on Science and Technology, 99th Congr., 1st Sess., no. 8, 19-20 Mar. 1985
(GPO-46-725) Avail: Subcommittee on Transportation, Aviation and Materials

Hearings held by the House Committee on Science and Technology on the Federal Aviation Administration fiscal year 1986 research, engineering, and development budget requests are presented. Statements in support of the implementation of R & D programs in the National Airspace System Plan are presented. B.W.

N86-21448# Committee on Science and Technology (U. S. House).
EARTHQUAKE HAZARDS REDUCTION ACT
Washington GPO 1985 194 p refs Hearing before the Subcommittee on Science, Research and Technology of the Committee on Science and Technology, 99th Congr., 1st Sess., no. 9, 19 Mar. 1985
(GPO-46-071) Avail: Subcommittee on Science, Research and Technology

The Subcommittee on Science, Research and Technology of the Committee on Science and Technology, House of Representatives (99th Congress) met on 19 March 1985 to discuss the Earthquake Hazards Reduction Act of 1977. The Act was formulated in view of the widespread recognition that earthquake hazard reduction was important to the nation as a whole. Although earthquake hazards are associated with relatively finite areas of the country, e.g., California, historically other areas of the country have experienced earthquake phenomena. Thirty-nine states are considered at risk, in which dwell some 70 million Americans. A panel of outside experts discussed the leadership role of FEMA Federal Emergency Management Agency) in the program, and what is being done on the Federal, State, and local level to implement the act. F.M.R.

N86-21449# Committee on Science and Technology (U. S. House).
ASSESS POTENTIAL GAINS AND DRAWBACKS OF CIVILIAN SPACE COOPERATION WITH THE SOVIETS
Washington GPO 1985 145 p refs Hearings before the Subcommittee on Space Science and Applications of the Committee on Science and Technology, 99th Congr., 1st Sess., no. 23, 30-31 Jul. 1985
(GPO-52-457) Avail: Subcommittee on Space Science and Applications

Topics discussed included: International Space Year; Mars resolution; cooperation between the U.S.S.R. and the U.S. in a joint space venture; technology tranfer and assessment; and scientific benefits. Areas of cooperation include: discussion and exchange of results, discussion of mission plans, sharing of experiments, and joint mission. B.G.

N86-21450# Committee of Conference (U. S. Congress).
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AUTHORIZATION ACT, 1986
Washington GPO 1985 18 p Report to accompany H.R. 1714 presented by the Committee of Conference to the 99th Congress, 1st Session, 19 Nov. 1985
(H-Rept-99-379; GPO-54-684) Avail: US Capitol, House Document Room

Appropriations to NASA for research and development, space flights, control and data communications, construction of facilities, and research and program management were discussed by the committee of conference. B.G.

N86-21451# National Bureau of Standards, Gaithersburg, Md.
US ACCESS TO JAPANESE TECHNICAL LITERATURE: ELECTRONICS AND ELECTRICAL ENGINEERING Final Report
Edward L. Brady, ed. Jan. 1986 168 p Presented at a Seminar held at Gaithersburg, Md., 24-25 Jun. 1986 Sponsored in part by Institute of Electrical and Electronics Engineers, Inc., New York, N.Y.
(NBS-SP-710; LC-85-600637) Avail: NTIS HC A08/MF A01

The problems existing in the transfer and exchange of Japanese science and technology information were discussed. The technical subject matter as restricted to electrical and electronics

engineering. The difficulties which arise from American business lack of knowledge of the Japanese language were explored. The nature of the problems of accessibility to Japanese technical literature and translators is assessed. The program was designed to provide an opportunity for individuals representing Congress, the practicing engineering community, industry, and educational committee to voice their concerns and their needs.

N86-21452# Committee on Science and Technology (U. S. House).
REPORTS SUBMITTED TO CONGRESS BY NASA PURSUANT TO HOUSE REPORT 98-65, TO ACCOMPANY H.R. 2065, THE NASA AUTHORIZATION ACT FOR FISCAL YEAR 1984
Washington GPO 1985 268 p refs Report to accompany H.R. 2065 presented by the Committee on Science and Applications to the Committee on Science and Technology, 98th Congress, 2d Session, Dec. 1984
(GPO-42-943) Avail: US Capitol, House Document Room

Topics discussed include: maintenance of expendable launch vehicles; space transportation marketing; 40x80 wind tunnel accident; civil applications of nuclear power; and research and technology for future space exploration. B.G.

N86-21453# Committee on Science and Technology (U. S. House).
ASSURED ACCESS TO SPACE DURING THE 1990'S
Washington GPO 1986 187 p Joint Hearings on HASC-99-9 before the Subcommittee on Space Science and Applications of the Committee on Science and Technology and the Subcommittee on Research and Development of the Committee on Armed Services, 99th Congress, 1st Session, no. 51, 23-25 Jul. 1985
(GPO-53-617) Avail: Subcommittee on Space Science and Applications

The Subcommittees on Space Science and applications, and the subcommittee on research and development held joint hearings on assured access to space during the 1990's. Topics discussed include: space transportation systems, launch vehicle requirements of the Space Station Program during the 1990's, commercial payloads and satellite launches, strategic defense initiative, DOD launch plans through the 1990's, space launch vehicle capacity, complementary expendable launch vehicles (CELV), and adequacy of the orbiter fleet to meet the launch requirements through the 1990's. E.A.K.

N86-21454# National Science Foundation, Washington, D.C. Div. of Science Resources Studies.
FEDERAL R AND D FUNDING BY BUDGET FUNCTION: FISCAL YEARS 1984-86 Final Report, 1984 - 1986
Mar. 1985 98 p
(PB85-232528; NSF-84-319) Avail: NTIS HC A05/MF A01 CSCL 05A

The report provides a distribution of Federal Research and Development programs based on the functions of the Federal budget. Analysis focuses on relative changes from 1984 to 1986 of chief R&D program areas within each function. Some 600 programs are identified with their budget authority levels for fiscal years 1984, 1985, and 1986. Included in the report is an agency/function crosswalk, correlating agencies contributing support to particular functional areas as well as historical tables in which Federal R&D funds by function are presented for 1955 to 1986. Author (GRA)

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N86-21455# Committee on Science and Technology (U. S. House).
THE 1985 SCIENCE AND TECHNOLOGY POSTURE HEARING WITH THE DIRECTOR OF THE OFFICE OF SCIENCE AND TECHNOLOGY POLICY
Washington GPO 1985 77 p Hearing before the Committee on Science and Technology, 99th Congr., 1st Sess., no. 1, 5 Feb. 1985
(GPO-44-080) Avail: Committee on Science and Technology

Presidential Science Adviser Dr. George Keyworth, Director of the Office of Science and Technology Policy, gave his annual (1985) report on U.S. Science and Technology posture at a hearing of the Committee on Science and Technology of the U.S. House of Representatives (99th Congress) on 5 Feb. 1985. He spoke of critical choices in three areas, i.e., how to reduce nuclear weapons, thereby to enhance the national security, how to ensure U.S. technological superiority in the face of rapidly growing international competition, and how to accomplish the foregoing while reducing government deficits. U.S. government support for Research and Development will total $60 billion this year, $20 of which are for non-defense programs, and $8 billion for basic research. He emphasized the importance of the latter to the nation's economic wellbeing, and the need to make every research dollar count in the face of rising costs and soaring deficits. Dr. Keyworth urges aggressive U.S. efforts to maintain its world leadership in science and technology. F.M.R.

N86-21456*# Westinghouse Research and Development Center, Pittsburgh, Pa.
DESIGN AND EVALUATION OF FLUIDIZED BED HEAT RECOVERY FOR DIESEL ENGINE SYSTEMS
J. R. Hamm, R. A. Newby, E. J. Vidt, and T. E. Lippert Jul. 1985 228 p refs
(Contracts DEN3-345; DE-AI01-80CS-50194)
(NASA-CR-174898; DOE/NASA-0345-1; NAS 1.26:174898) Avail: NTIS HC A11/MF A01 CSCL 13F

The potential of utilizing fluidized bed heat exchangers in place of conventional counter-flow heat exchangers for heat recovery from adiabatic diesel engine exhaust gas streams was studied. Fluidized bed heat recovery systems were evaluated in three different heavy duty transport applications: (1) heavy duty diesel truck; (2) diesel locomotives; and (3) diesel marine pushboat. The three applications are characterized by differences in overall power output and annual utilization. For each application, the exhaust gas source is a turbocharged-adiabatic diesel core. Representative subposed exhaust gas heat utilization power cycles were selected for conceptual design efforts including design layouts and performance estimates for the fluidized bed heat recovery heat exchangers. The selected power cycles were: organic rankine with RC-1 working fluid, turbocompound power turbine with steam injection, and stirling engine. Fuel economy improvement predictions are used in conjunction with capital cost estimates and fuel price data to determine payback times for the various cases. E.A.K.

N86-21457*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AUTOMOTIVE STIRLING SUMMARY AND OVERVIEW Final Report
William K. Tabata and Richard K. Shaltens [Oct. 1985] 12 p Presented at the 23rd Automotive Technology Development Contractors Coordination Meeting, Dearborn, Mich., 21-24 Oct., 1985; sponsored by DOE
(Contract DE-AI01-85CE-50112)
(NASA-TM-87177; E-2825; DOE/NASA-50112-61; NAS 1.15:87177) Avail: NTIS HC A02/MF A01 CSCL 13F

Government funded studies for adapting the Stirling engine to an automotive application started in 1971. The initial studies were to reduce exhaust emissions and were later broadened to include fuel economy and alternate fuels. With the passage of the Automotive Propulsion Research and Development Act of 1978, the studies matured into the current Automotive Stirling Engine (ASE) Program. After eight years of development effort, the accomplishments of the ASE Program are reviewed to assess the

outlook for program success at its scheduled completion in September 1987. One important goal of the ASE Program is the transfer of Stirling engine technology to the USA. The technology transfer to the ASE Program team members was accomplished. To expand the transfer in the USA, various activities were initiated to make available the developed automotive Stirling engine technology to other U.S. industries, including nonautomotive.
Author

N86-21458# Committee on Science and Technology (U. S. House).
TECHNOLOGY TRANSFER
Washington GPO 1985 258 p Hearings before the Subcommittee on Science, Research and Technology of the Committee on Science and Technology, 99th Congress, 1st Session, no. 22, 21-22 May 1985
(GPO-49-539) Avail: Subcommittee on Science, Research and Technology

The Congressional Subcommittee on science, research and technology held hearings on primarily technology transfer. The legislation was proposed on: utilization of federal technology basic research, commercializing intellectual property, technology utilization, stimulation of global competition, improvement of city services, stimulation of local economics, Federal commercial cooperation, and technology transfer from Government to private sector. E.A.K.

N86-21459# Appropriate Technology International, Washington, D.C.
SYSTEM FOR THE MONITORING AND EVALUATION OF APPROPRIATE TECHNOLOGY PROJECTS
E. L. Hyman and T. C. Corl Feb. 1985 82 p
(Contract AID/DSAN-G-0047)
(PB85-224798) Avail: NTIS HC A05/MF A01 CSCL 05A

A.T. International's monitoring and evaluation system for field projects is described. It is designed primarily to assist ATI's field staff and the organizations in LDCs that collaborate with ATI in evaluating selected projects. Part 1 of the paper contains a general discussion of monitoring and evaluation -- their definitions, objectives, and relationship to the project planning and implementation process. It aslo states the case for preparation of an information framework for systematic and efficient monitoring and evaluation. Part 2 discusses the information framework adopted by ATI--the Project monitoring and Evaluation System (PMES). Appendix A includes a list of French-Spanish translations of key terms. Appendix B contains an example of a completed PMES form for a hypothetical appropriate technology project. Appendix C contains a blank PMES form for reproduction purposes. GRA

N86-21460# National Bureau of Standards, Gaithersburg, Md. Public Information Div.
NBS (NATIONAL BUREAU OF STANDARDS) RESEARCH REPORTS
Jul. 1985 38 p
(PB85-236354; NBS/SP-680/3; LC-85-600549) Avail: NTIS HC A03/MF A01 CSCL 14B

Reports are presented of research conducted by the NBS (National Bureau of Standards). Topics discussed include: polymer composites; amperes; lightning measurement; fire research for building safety; advanced heat pumps; ozone measurement; ultraviolet wavelength standards; space telescope calibrations; and quality of clinical measurements. B.W.

N86-21461# National Science Foundation, Washington, D.C.
NATIONAL SCIENCE FOUNDATION, VOLUME 1 Annual Report, 1984
1985 123 p
(PB85-232551) Avail: NTIS HC A06/MF A01 CSCL 05A

The annual report to the U.S. Congress is required by law. The results of scientific and engineering research supported by the Foundation during the past fiscal year are summarized. Also included are a statement by the NSF Director and five appendixes (financial report, patents list, staff and advisory committee members, etc.) GRA

88 SPACE SCIENCES (GENERAL)

N86-21462# Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
[ACTIVITIES REPORT OF THE INSTITUTE FOR EXTRATERRESTRIAL PHYSICS] Status Report, 1983 - 1985
Aug. 1985 77 p refs
(MPE-Rept-188; ISSN-0178-7101) Avail: NTIS HC A05/MF A01

Research in solar and space plasma physics; the solar system; the life cycle of stars; the interstellar medium; active galactic nuclei and quasars; and laboratory astrophysics is summarized. Solar flares; plasmas in interplanetary space; solar wind magnetosphere interactions; electrodynamic coupling of magnetosphere and ionosphere; equatorial ionosphere; and active plasma experiments are discussed. Infrared observations of planetary atmospheres; planet formation; star formation; X-ray emission from main sequence stars; cataclysmic variables; X-ray binaries; neutron stars; supernova remnants; local interstellar medium; molecular clouds; the galactic center and halo; high-resolution molecular spectroscopy in the vacuum UV; transition probabilities of faint lines; and determination of accurate potential energy curves are treated. Author (ESA)

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N86-21463 California Univ., San Diego.
A STUDY OF THE OPTICAL AND X-RAY PROPERTIES OF QUASARS Ph.D. Thesis
Steven Ever Bradley 1985 143 p
Avail: Univ. Microfilms Order No. DA8517893

Photoionization by the central nucleus is primarily responsible for the emission lines observed in quasars. If this view is correct, X-ray wavelength photons from the nucleus could play a role in determining the emission line strengths of the various chemical species present in quasars. All of the quasars in this sample have been previously observed with the Einstein Observatory. Strengths of the broad permitted emission lines as well as narrow forbidden lines are analyzed for correlations with the X-ray strength and the optical strength. Weak correlations with most of the strengths of the permitted emission lines with the X-ray strength are detected. This is apparent in the case of hydrogen Balmer emission. However, in the majority of cases, these correlations appear stronger with the optical luminosity. The forbidden lines do not show as strong an evidence for correlations as do the permitted lines. It has also been known for some time that the X-ray and optical continuum strengths are correlated. It is difficult to draw strong conclusions concerning any proposed physical basis for these correlations. Dissert. Abstr.

N86-21464 New Mexico State Univ., Las Cruces.
OCCULTATION AND LIGHTCURVE ANALYSIS: THE FIGURE OF 2 PALLAS Ph.D. Thesis
John Vincent Lambert 1985 142 p
Avail: Univ. Microfilms Order No. DA8519956

Techniques to analyze occultation and lightcurve observations of asteroids were developed and applied to the determination of the figure of 2 Pallas. The procedure consisted of first solving for the pole using modified implementations of photometric astrometry and amplitude-aspect. The derived pole and the results from two stellar occultations were then used to identify the triaxial ellipsoid best approximating the figure of Pallas. A computer model, developed for the simulation of the lightcurves of irregularly shaped bodies with complex surface scattering functions, was used to compare theoretical lightcurves for the derived ellipsoid with observations. The method of computing the subearth point was changed to use the phase angle bisector rather than line of sight

and a more direct method of calculating the change in the subpoint between epochs was incorporated to remove restrictions on pole latitudes. An amplitude-aspect analysis was performed to select between the two resulting solutions, again, modified to utilize the phase angle bisector. When the pole of an asteroid is known, and observed elliptical occultation profile could be produced only by a restricted set of triaxial ellipsoids. If, as for 2 Pallas, multiple occultation profiles are available, the triaxial ellipsoid best approximating the figure of the asteroid can be identified. The ellipsoid obtained from the analysis of the two Pallas occultations has equatorial dimensions of 580 to 8 and 522 + or - 2 Km, and a polar dimension of 478 + or - 18 Km. Dissert. Abstr.

N86-21465 Pittsburgh Univ., Pa.
AN ANALYSIS OF THE ROTATION EFFECT IN THE RADIAL VELOCITY CURVE OF THE ECLIPSING BINARY DELTA LIBRAE Ph.D. Thesis
Thaddeus Francis Worek 1985 251 p
Avail: Univ. Microfilms Order No. DA8519464

Using 339 spectra obtained at the Kitt Peak National Observatory in 1981, 1983 and 1984, the pulse like disturbance that appears in the radial velocity curve of the eclipsing binary Delta Librae was isolated. This pulse is symmetric in 1983 but asymmetric in 1984. To account for the latter pulses, it is proposed that apparent expansion velocity and fractional luminosity of the envelope were derived. Other models that might explain the asymmetric rotation pulsed were considered and observations are equally satisfied if the spin axis of the primary star is tilted and precession. However, both the magnitude of the obliquity angle and the rapidity of its decay as indicated in the numerical fitting are judged unrealistic and appear to discredit this alternative explanation. Dissert. Abstr.

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N86-21466 California Univ., San Diego.
A MAGNETOSPHERIC CRITICAL IONIZATION VELOCITY EXPERIMENT Ph.D. Thesis
Patrick K. Newell 1985 159 p
Avail: Univ. Microfilms Order No. DA8515599

A barium injection sounding rocket experiment (The Star of Lima) was conducted to investigate Afven's critical ionization velocity (CIV) hypothesis in space. A particle detection experiment consisting of five retarding potential analyzers was undertaken. Several possible explanations for this low ionization efficiency are explored. It is shown that based both on the data set and on theoretical calculations that the superthermal electrons required for the CIV to operate were contained; and that the ionization rate was not limited by momentum considerations. It is shown that loss of electron energy to background oxygen places a strict lower limit on the barium cloud density for which CIV effects are possible; and loss of energy through barium line radiation increases by square root of 2 the necessary velocity for the onset of this effect. The most likely explanation for the negative result in the Star of Lima experiment is that the length of the cloud parallel to the magnetic field was smaller than the fastest growing modes of the lower hybrid instability believed to energize the electrons. Dissert. Abstr.

N86-21467 California Inst. of Tech., Pasadena.
DYNAMICAL ELECTROMAGNETIC FIELDS NEAR BLACK HOLES AND MULTIPOLE MOMENTS OF STATIONARY, GENERAL RELATIVISTIC SYSTEMS Ph.D. Thesis
Wai Mo Suen 1985 177 p
Avail: Univ. Microfilms Order No. DA8519566

Electromagnetic fields were studied in terms of the membrane formalism for black holes with the aim of developing formalism into a complete, self consistent description of electromagnetic and gravitational fields in a black hole background. Various model problems are presented as aids in understanding the interactions of electromagnetic fields with a black hole, and special attention is paid to the concept of the stretched horizon. A multipole moment formalism was developed for a general stationary system in general relativity. The multipole moments are defined in terms of a general formal series solution of the stationary Einstein equation, in analogy to multipole moments in the Newtonian theory of gravity. These relativistic moments exhibit many desirable properties and are useful in studying the interactions between a gravitating body and an external gravitational field. A model calculation applying the formalism to a black hole interacting with an external multipole field shows that the interaction can be understood in terms of elastic moduli of the black hole horizon. Dissert. Abstr.

N86-21468 New Mexico State Univ., Las Cruces.
THE NEUTRAL SODIUM D SUB 2 LINE IN LATE-TYPE STARS Ph.D. Thesis
Daniel Craig Boice 1985 229 p
Avail: Univ. Microfilms Order No. DA8519967

The effects of a stellar chromosphere on the Na 1 D2 profile are investigated. The analysis of line profile parameters yields the following results: (1) a relationship between the line width and the luminosity for the giants and supergiants does not exist for Na 1 D2 as has been observed for CA 11 K core emission and H 1 alpha; (2) the correlation between Na 1 D2 line width and luminosity for the through K dwarfs is explained in terms of differences in effective temperature and surface gravity along with the main sequence, the dME stars exhibit central reverals in the Na 1 D lines; (3) the method of Steintz was used to measure Doppler widths for H 1 alpha and Na 1 D2 lines under the assumption of a constant properties atmosphere. The H 1 alpha measurements imply supersonic nonthermal velocities for the giants and supergiants. Nonthermal velocities less than 10 km/sec are needed to explain the Na 1 D2 Doppler widths for three dwarfs. For the two stars, EQ Vir (dK5e) and Gl616.2 (dM1.5E), a detailed study of the formation of Na I D2 is presented applying the non-LTE radiative transfer method and using model chromospheres. The calculations provide a consistency check on the chromospheric models inferred from the CA II K diagnostics. Dissert. Abstr.

N86-21469 Harvard Univ., Cambridge, Mass.
TOPICS IN INFLATIONARY COSMOLOGY Ph.D. Thesis
Ronald Nathan Kahn 1985 351 p
Avail: Univ. Microfilms Order No. DA8520223

The theory of inflationary cosmology was examined. The existence of Hawking Radiation during the slow-rolling period of a new inflationary universe is proven, and derives and somewhat extends Bardeen's gauge invariant formalism for calculating the growth of linear gravitational perturbations in a Friedmann-Robertson-Walker cosmological background. This formalism is applied, first to several new inflationary universe models which all show a Zel'dovich spectrum on fluctuations, but with amplitude delta (100) above observational limits. The general formalism is next applied to models which exhibit primordial inflation. Fluctuations in these models also exhibit a Zel'dovich spectrum, with an acceptable amplitude. The results of new, numerical calculations are presented. A classical, (2 + 1) dimensional computer model is developed which includes a Higgs field along with enough auxiliary fields to generate dynamically not only a thermal bath, but also the fluctuations which naturally accompany that bath. Dissert. Abstr.

N86-21470 New Mexico State Univ., Las Cruces.
THE MORPHOLOGY OF THE PLANETARY NEBULA NGC 3242 Ph.D. Thesis
Randy Warren Olson 1985 109 p
Avail: Univ. Microfilms Order No. DA8519961

Observations of the Balmer decrement were used to obtain information about the internal structure on the doubleshell planetary nebula NGC 3242. Variations in the Balmer decrement are associated with reddening, self absorption, and changes in excitation mechanisms. Variations in the intensity line ratios allow

the definition and position of a shock wave to be determined. By using high resolution plots of the Balmer-line ratios, a simple straightforward method for finding and locating weak shocks in H II regions is proposed. It is demonstrated that a shock front exists at the boundary between the inner and outer shells of NGC 3242. The discontinuity is moving into the outer shell at a speed of 1.3 times the speed of sound in that material. Temperature, density, and velocity variations in this nebula support the model developed for the existence of a shock front in NGC 3242. Dissert. Abstr.

N86-21471 Harvard Univ., Cambridge, Mass.
SOME ASTROPHYSICAL APPLICATIONS OF MHD INSTABILITIES OF DIFFERENTIALLY ROTATING FLUIDS Ph.D. Thesis
Bruce Donald Popp 1985 115 p
Avail: Univ. Microfilms Order No. DA8520271

The combined effect of differential rotation and a magnetic field on the stability of certain astrophysical fluids were considered. The properties of multiply diffusive instabilities driven by both magnetic buoyancy and differential rotation were investigated. The governing equations for these instabilities are obtained by modifying the magnetic Boussinesq equations; the linear dispersion relation for axisymmetric and nonaxisymmetric perturbations is derived. This dispersion relation is investigated numerically for parameters relevant to the solar radiative interior and a thin magnetized accretion disk about a one solar mass central object. The effect of these instabilities on the magnetization of the solar interior was investigated. Dissert. Abstr.

N86-21472 Montana State Univ., Bozeman.
LIMITS TO THE EXTRAGALACTIC DISTANCE SCALE FROM INTEGRATED PROPERTIES OF LOCAL GROUP GALAXIES Ph.D. Thesis
David John Westpfahl, Jr. 1985 173 p
Avail: Univ. Microfilms Order No. DA8519362

Integrated properties, magnitudes and isophotal diameters of the Local Group galaxies M31 and M33 are used to set upper and lower limits to the extragalactic distance scale in the direction of the Virgo cluster and the Ursa Major cluster. The assumption is made that M31 should not be larger or brighter than the largest, brightest cluster members, so a lower limit to the distance modulus of the cluster can be calculated. It is also assumed that M33 should not be smaller or fainter than the smallest, faintest cluster members, so an upper limit to the distance modulus can be calculated. Data are collected in three systems with several correction schemes, and cluster membership lists are compared to determine the largest, brightest, smallest, and faintest members. The results depend upon the radial velocities of the clusters, which are in dispute. The method is applied to groups of galaxies seen in projection behind the Virgo and Ursa Major clusters, and to groups in the direction opposite to the clusters. It is concluded many small groups have a component of motion toward the clusters, relative to a uniform Hubble flow. Dissert. Abstr.

N86-21473 Melbourne Univ., Carlton (Australia).
THE ALLENDE METEORITE: INFORMATION FROM Ca-Al-RICH INCLUSIONS ON THE FORMATION AND EARLY EVOLUTION OF THE SOLAR SYSTEM Ph.D. Thesis
David Andrew Wark 1984 411 p
Avail: Univ. Microfilms Order No. DA8518695

Chemical and petrological investigations of the Allende CV carbonaceous chondrite meteorite show that the different types of Ca-Al-rich inclusions (CAI's) in Allende formed variously as molten or semimolten evaporative residues, as solid condensates, as liquid condensates, as fine grained condensates, and from melted fine grain aggregates. Once formed, many of these materials grew further by capture, aggregation and overgrowth. The mass dependent isotopic fractionation in the isotopically anomalous FUN CAI's was probably produced by the slow volatilization of excessive amounts of silicate dust in the primordial solar nebula; the volatization could simultaneously also have created the oxidizing conditions that gave rise to the characteristic chemical signatures of FUN CAI's. FUN CAI's appear to be either oxidized evaporative residues enriched in refractory elements and heavy isotopes, or the complementary refractory depleted, heavy isotope depleted condensates. Various lines of evidence indicate that all the components of Attende formed within a relatively circumscribed region of the solar nebula. Dissert. Abstr.

N86-21474 Michigan Univ., Ann Arbor.
PRIMITIVE TERRESTRIAL ATMOSPHERES Ph.D. Thesis
Kevin John Zahnle 1985 274 p
Avail: Univ. Microfilms Order No. DA8521019

A 23.3 year periodicity preserved in a 2500 million year old banded iron formation is interpreted as reflecting the climatic influence of the lunar nodal tide. The lunar distance is deducted as 52 Earth radii. The implied history of Precambrian tidal friction is in excellent agreement with both more recent paleontological evidence and the long term stability of the lunar orbit. The solar semidiurnal thermal tide was resonant with the natural period of the atmosphere when the day was approximately 21.3 hours at the end of the Precambrian. The resonant atmospheric tide was large enough (.01 bar at the surface) to have influenced the weather. In contrast to lunar oceanic tides, the gravitational torque on the thermal tide accelerates the Earth's rotation rate; near resonance the opposing torques were comparable, so that the day was stabilized near 21.3 hours for much of the Precambrian. Methane photochemistry in the primitive terrestrial atmosphere is studied using a detailed numerical model. Dissert. Abstr.

N86-21475*# Michigan Univ., Ann Arbor. Dept. of Astronomy.
HYDROGEN LINE RATIOS IN SEYFERT GALAXIES AND LOW REDSHIFT QUASARS Final Technical Report, 1 Jun. 1983 - 31 Jul. 1984
Gerard R. Kriss 1984 14 p refs
(Grant NAG5-324)
(NASA-CR-176547; NAS 1.26:176547) Avail: NTIS HC A02/MF A01 CSCL 03B

New observations of the Lymal alpha radiation/hydrogen alpha radiation ratio in a set of X-ray selected active galactic nuclei and an archival study of International Ultraviolet Explorer (IUE) observations of Lymal alpha low redshift quasars and Seyfert galaxies have been used to form a large sample for studying the influence of soft X-rays on the enhancement of Balmer emission in the broad line region. In common models of broad line clouds, the Balmer lines are formed deep in the interior, largely by collisional excitation. Heating within the clouds is provided by soft X-ray radiation, while Lymal alpha is formed mainly by recombination after photoionization. The ratio Lymal alpha/Halpha is expected to depend weakly on the ratio of ionizing ultraviolet luminosity to X-ray luminosity (L sub UV/I sub x). If the Lymal alpha luminosity is used as a measure of L sub UV' a weak dependence of Lymal/H alpha on the X-ray luminosity is found similar to previous results.
Author

N86-21476*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
THEORETICAL STUDIES OF CHROMOSPHERES AND WINDS IN COOL STARS Semiannual Progress Report, 1 Apr. - 30 Sep. 1985
Lee Hartmann Jan. 1986 18 p refs
(Grant NAGw-511)
(NASA-CR-176524; NAS 1.26:176524; SAPR-4) Avail: NTIS HC A02/MF A01 CSCL 03B

Propagation of pulsational waves through the atmosphere of the M supergiant alpha Ori was explored using a time dependent hydrodynamic code. Wind properties for three FU Orionis objects were determined using radiative transfer models based on optical line profiles. The effects of varying wind temperature while keeping the velocity steady were considered. Using the premise that FU Orionis eruptions result from massive accretions from a disk into a T Tauri star explains a variety of observational peculiarities of FU Orionis objects. B.G.

N86-21477*# Alabama Univ., Huntsville.
STUDY OF TRAVELLING INTERPLANETARY PHENOMENA (STIP) WORKSHOP TRAVEL Final Report

S. T. Wu Jan. 1986 46 p ref
(Grant NAGw-743)
(NASA-CR-176544; NAS 1.26:176544) Avail: NTIS HC A03/MF A01 CSCL 03B

Thirty six abstracts are provided from the SCOSTEP/STIP Symposium on Retrospective Analyses and Future Coordinated Intervals held in Switzerland on June 10 to 12, 1985. Six American scientists participated in the symposium and their abstracts are also included. The titles of their papers are: (1) An analysis of near surface and coronal activity during STIP interval 12, by T. E. Gergely; (2) Helios images of STIP intervals 6, B. V. Jackson; (3) Results from the analysis of solar and interplanetary observations during STIP interval 7, S. R. Kane; (4) STIP interval 19, E. Cliver; (5) Hydrodynamic buoyancy force in the solar atmosphere, T. Yeh; and (6) A combined MHD modes for the energy and momentum transport from solar surface to interplanetary space, S. T. Wu. E.R.

N86-21478*# California Inst. of Tech., Pasadena. Seismological Lab.
SHOCK-INDUCED VOLATILE LOSS FROM A CARBONACEOUS CHONDRITE: IMPLICATIONS FOR PLANETARY ACCRETION
James A. Tyburczy, Benjamin Frisch, and Thomas J. Ahrens 31 Jan. 1986 15 p refs
(Grant NGL-05-002-105)
(NASA-CR-176575; NAS 1.26:176575) Avail: NTIS HC A02/MF A01 CSCL 03B

Solid recovery impact-induced volatile loss experiments on the Murchison C2M meteorite indicate that for an impact of a given velocity, H2O and total volatiles are driven from the sample in the same proportion as present initially. The primitive surface volatile budget of a planet growing by accretion would have the same bulk elemental composition as the volatiles in the incident planetesimals. Incipient devolatilization of Murchison occurs at an initial shock pressure of about 11 GPa and complete devolatilization occurs at a pressure of about 30 GPa. For the Earth, incipient and complete devolatilization of accreting planetesimals would occur when the planet reached approximately 12% and 27%, respectively, of its present-day radius. Impact-induced devolatilization would profoundly affect the volatile distribution within the accreting planet. Prior to metallic core formation and internal differentiation the growing planet would have a very small core with the same volatile content as the incident material, a volatile depleted mantle, and an extremely volatile rich surface. In the case of the Earth, 99.4 wt% of the total incident volatile material would end up on or near the planetary surface. E.A.K.

N86-21479*# California Inst. of Tech., Pasadena. Seismological Lab.
OBLIQUE IMPACT: A PROCESS FOR PROVIDING METEORITE SAMPLES OF OTHER PLANETS
John D. OKeefe and Thomas J. Ahrens 10 Mar. 1986 16 p refs
(Grant NsG-7129)
(NASA-CR-176616; NAS 1.26:176616) Avail: NTIS HC A02/MF A01 CSCL 03B

Cratering flow calculations for a series of oblique to normal impacts of silicate projectiles onto a silicate halfspace were carried out to determine whether the gas produced upon shock vaporizing both projectile and planetary material could entrain and accelerate surface rocks and thus provide a mechanism for propelling SNC meteorites from the Martian surface. The difficult constraints that the impact origin hypothesis for SNC meteorites has to satisfy are that these meteorites are lightly to moderately shocked and yet were accelerated to speeds in excess of the Martian escape velocity. Two dimensional finite difference calculations demonstrate that at highly probable impact velocities, vapor plume jets are produced at oblique impact angles of 25 deg to 60 deg and have speeds as great as 20 km/sec. These plumes flow nearly parallel to the planetary surface. It is shown that upon impact of projectiles having radii of 0.1 to 1 km, the resulting vapor jets have densities of 0.1 to 1 g/cu.cm. These jets can entrain Martian surface rocks and accelerate them to velocities >5 km/sec. It is suggested that this mechanism launches SNC meteorites to Earth. Author

N86-21480# Los Alamos National Lab., N. Mex.
HALOS AROUND ELLIPTICALS AND THE ENVIRONMENT DEPENDENCE OF HUBBLE TYPE
W. H. Zurek, P. J. Quinn, and J. K. Salmon 1985 3 p Presented at the International Astronomical Union Meeting, Princeton, N.J., 24 Jun. 1985 Prepared in cooperation with California Inst. of Tech., Pasadena
(Contract W-7405-eng-36)
(DE86-000755; LA-UR-85-3314; CONF-8506199-1) Avail: NTIS HC A02/MF A01

It is not surprising that the baryonic material inside the more compact halos will tend to form a more compact, luminous elliptical. What needs to be explained is the difference in the value of the spin parameter (lambda). It might be tempting to speculate that more compact, dense halos have systematically smaller values of lambda. Such an effect is predicted by linear calculations. Our simulations show that it may exist but it appears to be too small compared to the random scatter of the values of lambda and rho to be decisive. It is more likely that the baryonic material has initially similar lambda both in the future spirals and elliptical but compact halos damp out the lambda of the dissipative, baryonic material more readily. DOE

N86-21481# Brookhaven National Lab., Upton, N. Y.
NUCLEAR EQUATION OF STATE, GENERAL RELATIVITY AND SUPERNOVAE EXPLOSIONS
S. Kahana 1985 5 p refs Presented at the International School for Intermediate Energy Nuclear Physics, Veronna, Italy, 20 Jun. 1985
(Contract DE-AC02-76CH-00016)
(DE86-001193; BNL-37038; CONF-850634-2) Avail: NTIS HC A02/MF A01

Prompt explosions are obtained in hydrodynamic simulations for the 12 Msub solar and 15 Msub solar type 2 supernova initial models of Weaver and Woosley, when the nuclear equation of state is sufficiently soft and when general relativity is included. DOE

N86-20928# Joint Publications Research Service, Arlington, Va.
POSTULATED METEORITIC STRUCTURES IN ROSS SEA (ANTARCTICA) Abstract Only
L. P. Khryanina *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 53 Transl. into ENGLISH from Izvestiya Akademii Nauk SSSR: Seriya Geologicheskaya (Moscow, USSR), no. 8, Aug. 1985 p 128-132 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N86-21482 California Inst. of Tech., Pasadena.
THE ANNUAL HEAT BALANCE OF THE MARTIAN POLAR CAPS, FROM VIKING OBSERVATIONS Ph.D. Thesis
David Abbey Paige, Jr. 1985 222 p
Avail: Univ. Microfilms Order No. DA8519557

The first measurements of the annual heat budgets of the polar caps of Mars from spacecraft observations are presented. The primary motivation is to understand why seasonal CO2 frost deposits at the north pole of Mars disappear in the summer, whereas seasonal CO2 deposits near the south pole do not. Annual radiation budgets for the core regions of the north and south polar caps are determined from solar reflectance and infrared

emission observations obtained by the Infrared Thermal Mappers aboard the two Viking orbiters. Results show that the absence of CO2 frost at the north pole during summer is primarily due to an asymmetry in the rates of CO2 frost sublimation at surface in the north and south during spring. It is suggested that the unexpected properties of Martian seasonal frost deposits are caused by the tendency for dust particles within the frost to absorb solar radiation, sublimate the soil CO2 that supports them and sink into the frost. Dissert. Abstr.

N86-21483*# Arizona State Univ., Tempe. Dept. of Geology.
MARTIAN SURFACE PROPERTIES Final Technical Report
Ronald Greeley 1 Jan. 1986 8 p
(Grant NAGw-263)
(NASA-CR-176556; NAS 1.26:176556) Avail: NTIS HC A02/MF A01 CSCL 03B

The objectives were: to characterize surficial geologic units through integration of Infrared Thermal Mapper (IRTM)-derived regolith properties with other existing remote sensing data; to determine the physical and spectral properties of volcanic units in the mid-latitudes of Mars through the synthesis of the highest resolution IRTM, radar, and imaging data available; and to identify and characterize aeolian terrains on Mars using physical surface characteristics determined from remote sensing data. Author

N86-20441# Joint Publications Research Service, Arlington, Va.
SAGDEYEV ON INTERNATIONAL TRACKING, PROCESSING OF VEGA BALLOON PROBE
In its USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 30-32 Transl. into ENGLISH from Pravda (Moscow, USSR), 27 Aug. 1985 p 3 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

N86-20442# Joint Publications Research Service, Arlington, Va.
RESULTS FROM VENUS CLOUD STUDIES ON VEGA CRAFT
V. Moroz and L. Mukhin *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 33-34 Transl. into ENGLISH from Pravda (Moscow, USSR), 18 Nov. 1985 p 8 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

N86-20443# Joint Publications Research Service, Arlington, Va.
COMMENTARY ON 15TH LUNAR-PLANETARY CONFERENCE
V. V. Shevchenko *In its* USSR Report: Space (JPRS-USP-86-002) 10 Feb. 1986 p 35-38 Transl. into ENGLISH from Zemlya I Vselennaya (Moscow, USSR), no. 6, Nov. - Dec. 1984 p 43-45 Conf. held at Houston, Tex., Mar. 1984 (For primary document see N86-20437 11-12)
Avail: NTIS HC A05

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N86-21484 National Research Council of Canada, Ottawa (Ontario).
OBSERVATIONS OF SOLAR FLUX AT THE ALGONQUIN RADIO OBSERVATORY ON 2800 MHz AND THE DOMINION RADIO ASTROPHYSICAL OBSERVATORY ON 2700 MHz Monthly Reports, Jan. 1984 - Dec. 1984
M. B. Bell, H. P. Gagnon, and J. D. Moore Feb. 1985 101 p
(NRCC-24190; ARO-14) Copyright. Avail: Issuing Activity

Daily tabulations of the radio flux at 2800 MHz from the Algonquin Radio Observatory (ARO) and at 2700 MHz from the Dominion Radio astrophysical Observatory (DRAO) are presented for the year 1984. This period marks the ninth year into sunspot cycle 21. Author

N86-21485# Ceskoslovenska Akademie Ved, Prague. Astronomical Inst.
PROGNOZ DATA. PART 4: SOLAR X-RAY FLUX IN THE 4-8 keV BAND DURING THE PERIOD 1 JULY 1983 - 13 JANUARY 1984
B. Valnicek, F. Farnik, J. Sudova, B. Komarek, O. Likin, and N. Pisarenko 1985 189 p
(Publ-62) Avail: NTIS HC A09/MF A01

The Prognoz-9 satellite was launched with the fifth Czechoslovak solar X-ray photometer of the Prognoz type (RF-2P) onboard. The Prognoz-9 satellite was launched on July 1, 1983 into the orbit of apogee of 720,000 km and perigee of 380 km, inclination of 65 deg and orbital period of about 641 hours. The photometer was in operation till January 15, 1984. The instrument and survey plots obtained are included. Author

N86-21486*# California Inst. of Tech., Pasadena. Solar Observatory.
THE TWO TYPES OF FLARE ASSOCIATED FILAMENT ERUPTIONS
Frances Tang Jan. 1986 23 p refs Submitted for publication
(Grants NGL-05-002-034; NSF ATM-85-13577)
(NASA-CR-176571; NAS 1.26:176571; BBSO-0255) Avail: NTIS HC A02/MF A012 CSCL 03B

Using years of high resolution solar footage obtained at Big Bear Solar Observatory flare associated filament eruptions were studied. In addition to the classical type eruption consisting of expansion and breakup, evidence was found of another type where a layer is shed from the filament and erupts while the inversion line filament below (or, what is left of it) remains in place. Both types of eruptions are presented. It is hoped that the new evidence will shed new light on the understanding of the role of filaments in flares. Author

N86-21487*# Delaware Univ., Newark.
IONIC CHARGE DISTRIBUTIONS OF ENERGETIC PARTICLES FROM SOLAR FLARES Semiannual Report, 1 Jul. - 31 Dec. 1985
D. J. Mullan and W. L. Waldron (Applied Research Corp., Landover, Md.) 25 Mar. 1986 10 p
(Grant NAG5-567)
(NASA-CR-176610; NAS 1.26:176610) Avail: NTIS HC A02/MF A01 CSCL 03B

The effects which solar flare X-rays have on the charge states of solar cosmic rays is determined quantitatively. Rather than to characterize the charge distribution by temperature alone, it is proposed that the X-ray flux at the acceleration site also is used. The effects of flare X-rays are modeled mathematically. E.R.

N86-21488# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A SYNCHROTRON/INVERSE COMPTON INTERPRETATION OF A SOLAR BURST PRODUCING FAST FLUXES AT LAMBDA > 3mm AND HARD X-RAYS
P. Kaufmann, E. Correia, J. E. R. Costa, and A. M. Zodi Vaz Oct. 1985 35 p refs Submitted for publication
(INPE-3667-PRE/824) Avail: NTIS HC A03/MF A01

The recently discovered new class of solar burst emission component exhibiting very fast pulses (duration approximately 60 ms) at mm-waves only (delta < 3 mm) and at hard X-rays, poses serious constraints for interpretations. Ultrarelativistic electrons are likely to be required in order to explain the high spectral turnover frequency. The time scales, however, are too small to be explained by synchrotron losses alone, or by bremsstrahlung losses, unless extremely large ambient plasma densities are assumed. The mm-wave emission is associated with a synchrotron component and hard X-rays with the inverse Compton process. The observed mm-wave emission is in the optically thick part of a spectrum peaking somewhere in the infrared range of frequencies, and the electron energies are reduced primarily by inverse Compton quenching on the synchrotron source photons. The model explains self-consistently the X-rays/sub-mm flux ratio and the short time scales. It also accounts for typical fluxes reported for white light flares. Author

N86-21489# National Geophysical Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 487, MARCH 1985. PART 1: (PROMPT REPORTS). DATA FOR FEBRUARY 1985, JANUARY 1985 AND LATE DATA
H. E. Coffey Mar. 1985 109 p
(PB85-201440; SGD-487-Pt-1) Avail: NTIS HC A06/MF A01 CSCL 03B

Solar-Geophysical Data Number 487, March 1985, Part 1 (Prompt Reports) contains data on the following: Detailed index for 1984 to 1985; Data for February 1985 -- (IUWDS alert periods, Advance and worldwide), Solar activity indices, Solar flares, Solar radio emission, GOES solar proton events 1976 - January 1985, Inferred interplanetary magnetic field polarity, Mean solar magnetic field); Data for January 1985 -- (Solar active regions, Sudden ionospheric disturbances, Solar radio spectral observations, Cosmic ray measurements by neutron monitor, Geomagnetic indices, Radio propagation indices); Late data -- (Pioneer XII solar indices, Geomagnetic indices December 1984, Solar radio emission July 1982, cosmic rays August-September 1978 Climax May 1983 Huancayo, calcium plage regions, Errata--Cosmic rays Kiel and Toyo August 1983). GRA

N86-21490# National Geophysical Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 487, MARCH 1985. PART 2 (COMPREHENSIVE REPORTS). DATA FOR SEPTEMBER 1984, JULY-NOVEMBER 1982
H. E. Coffey Mar. 1985 188 p
(PB85-201457; SGD-487-PT-2) Avail: NTIS HC A09/MF A01 CSCL 03B

Detailed index for 1984-1985; Data for September 1984-- (Meudon carte synoptique, Solar radio bursts at fixed frequencies, Solar X-ray radiation from GOES satellite, Mass ejections from the Sun, Active prominences and filaments); Data for July-November 1982 -- (Solar flares July 1982, Solar flares August 1982, Solar flares September 1982, Solar flares October 1982, Solar flares November 1982, Intervals of no flare patrol observation July - November 1982, Number of flares August 1966 - November 1982). GRA

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N86-21491 Harvard Univ., Cambridge, Mass.
SYNCHROTRON EMISSION MODELS FOR GAMMA-RAY BURST SOURCES, THE DETERMINATION OF THE ORIENTATIONS OF AM HERCULIS BINARIES, AND NON-ADIABATIC SHOCKS ON MAGNETIC WHITE DWARFS Ph.D. Thesis
Jerome James Brainerd 1985 261 p
Avail: Univ. Microfilms Order No. DA8520165

The validity of using classical electrodynamics to calculate emission from a relativistic plasma in a strong magnetic field is examined. The radiative transfer equations are derived for a plasma that has an idex of refraction close to one. Solutions are derived for the special case of a thermal plasma in a uniform magnetic field and temperature, with the effect of pairs included. Special attention is paid to behavior of the polarization. Synchrotron emission is explored as an emission mechanism for gamma ray bursts. The synchrotron emissivity is calculated for steady state thermal and power law particle distributions. Linearly polarized cyclotron emission from AM Herculis binaries is used to derive their orientations. The present models for AM Herculis binaries are unable to explain these results, suggesting a modification. Dissert. Abstr.

N86-21492*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ELECTROMAGNETIC DISSOCIATION EFFECTS IN GALACTIC HEAVY-ION FRAGMENTATION
John W. Norbury and Lawrence W. Townsend Feb. 1986 48 p refs
(NASA-TP-2527; L-16033; NAS 1.60:2527) Avail: NTIS HC A03/MF A01 CSCL 03B

Methods for calculating cross sections for the breakup of galactic heavy ions by the Coulomb fields of the interacting nuclei are presented. By using the Weizsacker-Williams method of virtual quanta, estimates of electromagnetic dissociation cross sections for a variety of reactions applicable to galactic cosmic ray shielding studies are presented and compared with other predictions and with available experimental data. Author

N86-21493# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE TIME BEHAVIOUR OF THE 8 KM/S WATER MASER SOURCE IN ORION
Z. Abraham, J. W. S. Vilas Boas, and L. F. delCiampo Dec. 1985 17 p refs Submitted for publication
(INPE-3731-PRE/861) Avail: NTIS HC A02/MF A01

The time behavior of the 8 km/s water maser source in Orion during the period August 1979 to November 1985 is reported. Four flares were detected, with rise times of the order of a month and decay times of the order of several months to a year. The source presented a high degree of linear polarization (30% to 60%), independent of the value of the intensity. The polarization angle varied between -3 deg and -36 deg, imposing constraints on possible models of the emitting region. Author

N86-21494# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SEARCH FOR FAST 22 GHz PULSES FROM GBS 0526-66
E. Correia, P. Kaufmann, J. W. S. Vilas Boas, and A. M. Zodi Vaz Nov. 1985 3 p ref Submitted for publication
(INPE-3702-PRE/843) Avail: NTIS HC A02/MF A01

The results of a survey of the gamma burst source GBS 0526-66 made at 22 GHz, with the 13.7-m Itapetinga antenna, during 5 days in 1984 to 1985 are reported. A distinct transient was observed on 3 January 1985, 05 15 17 UT, exhibiting 21 Jy intensity and 3.5 s duration. Author

N86-21495# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
OBSERVATIONS OF 3C273 WITH HIGH NORTH-SOUTH RESOLUTION
J. A. Biretta (California Inst. of Technology, Pasadena), M. H. Cohen (California Inst. of Technology, Pasadena), H. E. Hardebeck (California Inst. of Technology, Pasadena), P. Kaufmann, Z. Abraham, A. A. Perfetto, E. Scalise, Jr., R. E. Schaal, and P. M. Silva (Observatorio Nacional, Rio de Janeiro, Brazil) Nov. 1985 18 p refs Previously announced in IAA as A85-35438 Submitted for publication Sponsored in part by NSF/CNPq
(Grant NSF AST-82-10259)
(INPE-3713-PRE/849) Avail: NTIS HC A02/MF A01

VLBI maps of 3C 273 with high north-south resolution are presented. A strong, nonmonotonic curvature is found in the jet at projected radii of less than or equal to 5 pc. Measurements of the core size show that bulk relativistic motion in the core is not required for consistency with the observed X-ray flux. Author

N86-21496# Fermi National Accelerator Lab., Batavia, Ill.
HIGH ENERGY NEUTRINOS FROM CYG X-3
T. P. Walker, E. W. Kolb, and M. S. Turner Jul. 1985 11 p refs
(Contract DE-AC02-76CH-03000)
(DE85-013219; FNAL/C-85/99-A) Avail: NTIS HC A02/MF A01

Assuming that the UHE air showers from Cyg X-3 are produced by photons, the expected neutrino emission is calculated from a model which produces the (GAMMA)-rays in the atmosphere of the Cyg X-3 companion. The possibility of detecting such neutrinos in underground detectors is discussed. The constraints that such a signal places on the use of this model in other particle production scenarios is also discussed. DOE

N86-21497# Los Alamos National Lab., N. Mex.
COSMIC RAYS, SUPERNOVA AND THE ORIGIN OF ULTRAHIGH ENERGY PARTICLES
S. A. Colgate 1985 29 p Presented at the Symposium on Cosmogonical Processes, Boulder, Colo., 25 Mar. 1985
(Contract W-7405-eng-36)
(DE85-012712; LA-UR-85-1642; CONF-8503145-1) Avail: NTIS HC A03/MF A01

The acceleration of ultrahigh energy cosmic rays, greater than or equal to 10(15 to 20) eV, is still an unsolved problem in high-energy astrophysics. The now classical mechanism of stochastic acceleration of cosmic rays in a strong shock in the interstellar or intergalactic medium is limited in time and dimension for all likely acceleration sites, particularly for the highest energies. Acceleration of cosmic rays across a plasma shock of velocity, (BETA)/sub s/ ((BETA)/sub s/ = v/sub shock//c), requires 1/(BETA)/sub s/ number of crossings and therefore (1/(BETA)/sub s/) (2) number of scatterings for doubling the energy of a particle. This requires space of the order of 1/9BETA)/sub s/ x the scattering length, or a multiple of the Larmor radius and hence, the space requirements to cosmic ray acceleration are very many Larmor orbits in dimension, as well as times that are larger by (1/(BETA)/sub s/) (2) x t/sub Larmor/. The acceleration of cosmic rays by the shock in the envelope of a Type 1 supernova is reviewed, and the interaction of the accelerated matter with the nearby ISM is considered. DOE

N86-20914# Joint Publications Research Service, Arlington, Va.
EXPERIMENTS TO RECORD GRAVITATIONS
In its USSR Report: Earth Sciences (JPRS-UES-86-001) 10 Jan. 1986 p 38-39 Transl. into ENGLISH from Sotsialisticheskaya Industriya (Moscow, USSR), 4 Jul. 1985 p 4 (For primary document see N86-20887 11-42)
Avail: NTIS HC A04

99 GENERAL

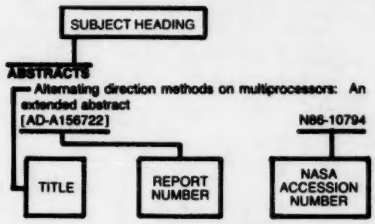
N86-21498*# National Aeronautics and Space Administration, Washington, D.C.
PROFILES OF EXCELLENCE
[1985] 88 p
(EP-186; NAS 1.19:186) Avail: NTIS HC A05/MF A01 CSCL 05D

Contributions by minorities to the NASA programs are highlighted by profiles of 80 personnel. Educational and professional histories are summarized. B.G.

N86-21499# Committee on Science and Technology (U. S. House).
ASTRONAUTS AND COSMONAUTS BIOGRAPHICAL AND STATISTICAL DATA, REVISED JUNE 28, 1985
Washington GPO Dec. 1985 407 p Presented to the Subcommittee on Space Science and Applications of the Committee on Science and Technology, 99th Congress, 1st Session, 26 Aug. 1985 Prepared by the Library of Congress, Congressional Research Service
(GPO-52-498) Avail: Subcommittee on Space Science and Applications

Astronauts' and cosmonauts' biographical and statistical data are reported. The following issues are described. Astronaut selection criteria, education and experience, medical and psychological condition; US payload specialists and passengers; the X-15, X-20 Dynasolar, and manned orbiting laboratory program, Soviet cosmonauts; non-US, non-Soviet spacenauts, and comparative data on American and Soviet spaceflights. E.A.K.

Typical Subject Index Listing



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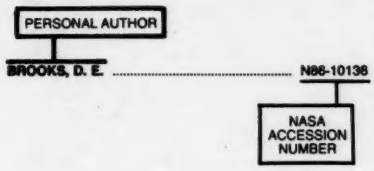

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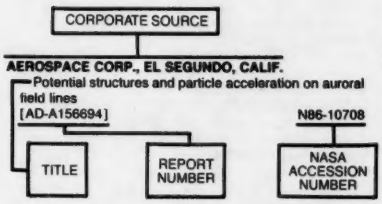

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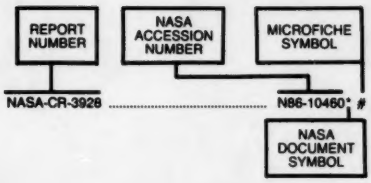

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AFGL-ERP-913 ..... N86-21001 #

AFGL-TR-84-0308 ..... N86-21077 #
AFGL-TR-85-0099 ..... N86-21001 #
AFGL-TR-85-0105 ..... N86-20761 #
AFGL-TR-85-0118 ..... N86-21076 #

AFHRL-TP-85-11 ..... N86-20413 #
AFHRL-TP-85-20 ..... N86-20658 #

AFIT/CI/NR-85-109T ..... N86-21141 #
AFIT/CI/NR-85-113D ..... N86-20938 #

AFIT/CI/NR-85-119T ..... N86-20509 #

AFIT/GLM/LSB/85S-52 ..... N86-21421 #

AFIT/GSM/LSY/85S-11 ..... N86-20388 #

AFOSR-85-0900TR ..... N86-20685 #
AFOSR-85-0942TR ..... N86-20865 #
AFOSR-85-0946TR ..... N86-21246 #
AFOSR-85-0949TR ..... N86-21243 #
AFOSR-85-0952TR ..... N86-21244 #
AFOSR-85-0966TR ..... N86-20486 #
AFOSR-85-0967TR ..... N86-21245 #
AFOSR-85-0969TR ..... N86-21404 #
AFOSR-85-1001TR ..... N86-20521 #
AFOSR-85-1077TR ..... N86-20488 #
AFOSR-85-1085TR ..... N86-21273 #

AFWAL-TR-85-2051 ..... N86-20522 #
AFWAL-TR-85-3042 ..... N86-20487 #

AFWAL-83-3041 ..... N86-20408 #
AFWAL-84-3099 ..... N86-20725 #

AGARD-AR-210 ..... N86-20376 #
AGARD-AR-227 ..... N86-20580 #

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AGARD-LS-143 ..... N86-20399 #

AGARD-R-722 ..... N86-20415 #

AI-M-865 ..... N86-21183 #

AMRL-TR-85-039 ..... N86-21140 #

ANL/EES-TM-287 ..... N86-20531 #

AR-1 ..... N86-20486 #
AR-2 ..... N86-20746 #
AR-004-041 ..... N86-20363 #
AR-004-047 ..... N86-20362 #
AR-1294 ..... N86-20368 #

ARL-AERO-PROP-R-167 ..... N86-20363 #

ARL-AERO-R-165 ..... N86-20362 #

ARL/STRUC-TM-414 ..... N86-20398 #

ARLCB-TR-85035 ..... N86-20866 #
ARLCB-TR-85037 ..... N86-20867 #

ARO-14 ..... N86-21484
ARO-17708.1-MS ..... N86-20571 #
ARO-18054.16-EL ..... N86-20687 #
ARO-18092.8-MA ..... N86-21182 #
ARO-18729.6-MS ..... N86-21403 #
ARO-19250.7-CH ..... N86-20545 #
ARO-19288.10-CH ..... N86-20500 #
ARO-19367.29-MA ..... N86-21254 #
ARO-20107.1-GS ..... N86-20939 #
ARO-20927.11-MA ..... N86-21255 #
ARO-21770.4-EG ..... N86-20812 #

ATR-1 ..... N86-21404 #

AVSCOM-TR-85-B-3 ..... N86-20349* #
AVSCOM-TR-85-B-6 ..... N86-20358* #

BAE-ARG-178 ..... N86-20719
BAE-ARG-184 ..... N86-20372 #

BAE-BT-10955 ..... N86-21350
BAE-BT-11140 ..... N86-20459
BAE-BT-12662 ..... N86-21155
BAE-BT-13198 ..... N86-20382

BAE-MDR-0748 ..... N86-20849

BAE-MSN-272-ISS-2 ..... N86-21227

BBC-RD-1985/13 ..... N86-20648
BBC-RD-1985/14 ..... N86-20649

BBSO-0255 ..... N86-21486* #
BBSO-0257 ..... N86-20758* #

BDX-613-3366 ..... N86-21188 #

BLL-CE-TRANS-8171-(9022.09) ..... N86-20539 #
BLL-CE-TRANS-8221-(9022.090) N86-21104
BLL-CE-TRANS-8223-(9022-09) N86-21146

BLL-M-TRANS-36527(5828.4) ..... N86-20540 #

BLL-OA-TRANS-3237-(C196.3) ..... N86-21362 #

BLL-RISLEY-TR-5110-(9091.9F) N86-21394
BLL-RISLEY-TR-5230-(9091.9F) N86-20790

BLLD-M-36540-TRANS-(5828.4) N86-21397
BLLD-M-36552-TRANS-(5828.4) N86-20715
BLLD-M-36553-TRANS-(5828.4) N86-20716

BLLD-TRANS-M-36506-(5828.4) N86-20791
BLLD-TRANS-M-36510-(5828.4) N86-20537
BLLD-TRANS-M-36512-(5828.4) N86-20842
BLLD-TRANS-M-36528-(5828.4) N86-20792

BLRDR-5801 ..... N86-21442 #
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BLRDR-5844 ..... N86-21441 #

BM-OFR-94-85 ..... N86-20559 #

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DC-81 ..... N86-21221 #

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NBS/SP-305-SUPPL-16 ..... N86-21435 #
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NOAA-TM-ERL-ARL-136 ..... N86-20984 #

NOAA-TM-ERL-ESG-14 ..... N86-21089 #

NOAA-TM-NESDIS-11 ..... N86-21439 #

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NSF-84-319 ..... N86-21454 #

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OCS/MMS-84-0073 ..... N86-20941 #
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UILU-ENG-85-2211 ..... N86-20686 #
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